

478 Advanced Clinical Microbiology
 Fall, Spring, Summer. 1 credit. R: Open only to seniors in the Clinical Laboratory Sciences major. C: MT 477 concurrently.
 Theoretical aspects of clinical microbiology and infectious disease. Integration of cognitive material with clinical laboratory test results.

495 Directed Study
 Fall, Spring, Summer. 1 to 3 credits. A student may earn a maximum of 6 credits in all enrollments for this course. R: Open only to students in the Clinical Laboratory Sciences or Medical Technology major or LBS Medical Technology coordinate major.
 Faculty directed study including assigned readings, reviews of appropriate scientific periodicals, research and laboratory experience.

496 Integrative Correlations in Clinical Laboratory Science I
 Fall, Spring. 1(2-0) P:M: (MT 213) R: Open only to juniors or seniors in the Medical Technology or Clinical Laboratory Science and Lyman Briggs coordinate majors.
 Application of the principles and concepts of clinical laboratory science in a problem-based learning format. Ethics, diagnostic value of laboratory tests, social-economic impact of laboratory tests and their regulation.

497 Integrative Correlations in Clinical Laboratory Science II
 Fall, Spring. 1(2-0) P:M: (MT 496) R: Open only to juniors or seniors in the Medical Technology or Clinical Laboratory Science and Lyman Briggs coordinate majors.
 Continuation of MT 496.

MICROBIOLOGY AND MOLECULAR GENETICS MMG

Department of Microbiology and Molecular Genetics College of Natural Science

101 Preview of Microbiology
 Fall. 1(1-0) R: Open only to freshmen or sophomores. SA: MPH 101
 Overview of modern microbiology, emphasizing impact on society.

103 Frontiers of Microbiology
 Spring. 1(2-0) R: Open only to freshmen and sophomores.
 Current microbiology research: significance to modern biological science and impact on society.

105 Microbes in Everyday Life
 Fall. 3(3-0)
 Role of microbes in agriculture, industry, and medicine. Impact on society of infectious diseases of plants and animals, soil fertility, water quality, biotechnology, genetic engineering, and bioremediation. Public health and environmental concerns.

111L Cell and Molecular Biology Laboratory
 Fall, Spring, Summer. 2(1-3) Interdepartmental with Biological Science; Plant Biology; Zoology. Administered by College of Natural Science. P:M: (BS111 or concurrently) Not open to students with credit in LBS 159H.
 Principles and applications of common techniques used in cell and molecular biology.

205 Allied Health Microbiology
 Spring. 3(3-0) SA: MPH 205
 Microbial structure, function, growth, death, and control related to medical and public health concerns. Host-parasite relationships, immunology, action of major pathogenic groups. Commercial applications of microbiology.

206 Allied Health Microbiology Laboratory
 Spring. 1(0-2) P:M: (MMG 105 or MMG 205 or concurrently) SA: MPH 206
 Fundamentals of microbiological techniques including microscopy, staining, aseptic technique, culture media, identification, control with disinfectants and antibiotics, and safety in the microbiological laboratory.

301 Introductory Microbiology
 Fall, Spring. 3(3-0) P:M: (BS 111 or LBS 145 or LBS 149H) and (CEM 251 or concurrently or CEM 351 or concurrently or CEM 143) SA: MPH 301
 Fundamentals of microbiology, including microbial structure and function, nutrition and growth, death and control. Importance and applications of major microbial groups.

302 Introductory Microbiology Laboratory
 Spring. 1(0-3) P:M: (MMG 105 or concurrently or MMG 205 or concurrently or MMG 301 or concurrently) SA: MPH 302
 Methodology of microbiology: microscopy, staining, aseptic technique, culture media, quantification, and laboratory safety.

408 Advanced Microbiology Laboratory (W)
 Fall. 3(1-6) P:M: (MMG 302 and MMG 431 or concurrently) and completion of Tier I writing requirement. R: Open only to students in the Department of Microbiology and Molecular Genetics or LBS Environmental Biology/Microbiology or Microbiology coordinate major. SA: MPH 408
 Microbiological techniques and procedures to study physiology and genetics of bacteria and bacteriophages. Collection and critical assessment of quantitative data and written communication of results.

409 Eukaryotic Cell Biology
 Spring. 3(3-0) P:M: (BS 111 or LBS 145 or LBS 149H) and (BMB 401 or concurrently or BMB 462 or concurrently) SA: MIC 403, MPH 403
 Structure and function of nucleated cells. Emphasis on the molecular mechanisms that underlie cell processes.

413 Virology
 Spring. 3(3-0) P:M: (BMB 462 or concurrently) RB: (MMG 409) SA: MPH 403
 Viruses and modern molecular biology. Viral replication and gene expression of the major classes of viruses. Virus-cell interactions and viral diseases.

421 Prokaryotic Cell Physiology
 Fall. 3(3-0) P:M: (MMG 301 and BMB 461 or concurrently) SA: MIC 401, MPH 401
 Prokaryotic cell structure and function. Growth and replication. Macromolecular synthesis and control.

425 Microbial Ecology
 Spring. 3(3-0) Interdepartmental with Crop and Soil Sciences. RB: (MMG 301) SA: MPH 425
 Microbial population and community interactions. Microbial activities in natural systems, including associations with plants or animals.

426 Biogeochemistry
 Summer. 3 credits. Summer: Given only at W.K. Kellogg Biological Station. Interdepartmental with Crop and Soil Sciences; Geological Sciences; Zoology. RB: (BS 110 or LBS 144 or LBS 148H or BS 111 or LBS 145 or LBS 149H) and (CEM 143 or CEM 251) SA: MPH 426
 Integration of the principles of ecology, microbiology, geochemistry, and environmental chemistry. Societal applications of research in aquatic and terrestrial habitats.

431 Microbial Genetics
 Fall. 3(3-0) P:M: (BMB 461 or concurrently) RB: (MMG 301 or ZOL 341) SA: MIC 401, MPH 401
 Genetics of bacteria, their viruses, plasmids, and transposons. Emphasis on genetic principles.

433 Microbial Genomics
 Spring. 3(2-3) P:M: (MMG 431) RB: (MMG 421 or BMB 461) and (CSE 101)
 Structure of microbial genomes and implications for growth and evolution of bacteria and fungi. Computer analysis of genome sequence databases. Applications to gene expression and phylogenetic analysis.

440 Food Microbiology
 Spring. 3(3-0) Interdepartmental with Food Science. Administered by Department of Food Science and Human Nutrition. P:M: (MMG 205 or MMG 301) and completion of Tier I writing requirement. R: Not open to freshmen or sophomores. SA: MPH 440
 Major groups of microorganisms of importance to the food industry. Emphasis on ecological, physiological, and public health aspects.

441 Food Microbiology Laboratory
 Spring. 2(0-4) Interdepartmental with Food Science. Administered by Department of Food Science and Human Nutrition. P:M: (FSC 440 or concurrently) and completion of Tier I writing requirement. RB: (MMG 206 or MMG 302) SA: MPH 441
 Methods for studying major groups of microorganisms important to the food industry. Isolation, enumeration, characterization, identification, and use of microorganisms.

445 Basic Biotechnology
 Fall. 3(3-0) P:M: (MMG 205 or MMG 301) SA: MPH 445
 Growth and genetic improvement of industrial microorganisms. Fermentation fundamentals. Specific classical and recombinant-based bioprocesses and bioconversions of commercial importance.

451 Immunology
 Fall. 3(3-0) P:M: (BS 111 or LBS 145 or LBS 149H) and (BMB 401 or concurrently or BMB 461 or concurrently) RB: (MMG 409) SA: MPH 451
 Structure and function of molecules involved in immune responses. Quantification of immune responses and cellular participants. Immunologic abnormalities. Immunotherapy. Experimental approaches to dissection of immune functions.

461 Molecular Pathogenesis
 Spring. 3(3-0) P:M: (MMG 301) RB: (MMG 431) SA: MPH 461
 Molecular basis of microbial virulence. Nature of determinants and their role in overcoming host defense mechanisms.

Microbiology and Molecular Genetics—MMG

463 Medical Microbiology
Fall. 3(3-0) P:M: (MMG 205 or MMG 301)
RB: (MT 432 or MMG 451) R: Open only to juniors or seniors in the Department of Microbiology and Molecular Genetics or Clinical Laboratory Sciences or Medical Technology major or LBS Environmental Biology/Microbiology or Medical Technology or Microbiology coordinate major. SA: MPH 463

Properties of pathogenic bacteria and viruses and their mechanisms of pathogenicity.

464 Diagnostic Microbiology Laboratory
Fall. 2(0-4) P:M: (MMG 463 or concurrently)
R: Open only to juniors or seniors in the Department of Microbiology and Molecular Genetics or Clinical Laboratory Sciences or Medical Technology major or LBS Environmental Biology/Microbiology or Medical Technology or Clinical Laboratory Science or Microbiology coordinate major. SA: MPH 464, MIC 464

Diagnostic procedures for the identification of pathogenic microbes.

490 Special Problems in Microbiology
Fall, Spring, Summer. 1 to 3 credits. A student may earn a maximum of 6 credits in all enrollments for this course. R: Approval of department. SA: MPH 490

Library research or tutorial instruction in advanced laboratory techniques.

491 Current Topics in Microbiology
Spring. 3(4-0) R: Open only to seniors in the Department of Microbiology and Molecular Genetics or LBS Environmental Biology/Microbiology or Microbiology coordinate major. SA: MPH 491

Capstone experience for microbiology majors. Presentation and discussion of journal articles. Writing of position papers. Topics such as microbial physiology, ecology, genetics, molecular biology, virology, immunology, or pathogenesis.

492 Undergraduate Research Seminar
Spring. 1(1-0) P:M: (MMG 499 or MMG 499H) R: Open only to seniors in the Department of Microbiology and Molecular Genetics or LBS Environmental Biology/Microbiology or Microbiology coordinate major. SA: MPH 492

Presentation and group discussion of undergraduate research results.

499 Undergraduate Research
Fall, Spring, Summer. 1 to 3 credits. A student may earn a maximum of 6 credits in all enrollments for this course. R: Open only to students in the Department of Microbiology and Molecular Genetics or LBS Environmental Biology/Microbiology or Microbiology coordinate major. SA: MPH 499

Participation in a laboratory research project.

499H Honors Research
Fall, Spring, Summer. 1 to 3 credits. A student may earn a maximum of 6 credits in all enrollments for this course. R: Open only to Honors College students in the Microbiology or Environmental Biology/Microbiology major or LBS Microbiology coordinate major or LBS Environmental Biology/Microbiology coordinate major. SA: MPH 499H

Research project with thesis and oral report. A portion of Microbiology capstone experience.

MILITARY SCIENCE MS

Department of Military Science Office of the Provost

101A Leadership: The Military Profession
Fall. 1(1-1) SA: MS 101 Not open to students with credit in MS 101B.

Introduction to military leadership and fundamental concepts of leadership. Application of leadership doctrine. The role of the U.S. Army, Army Reserves, and National Guard. Leadership laboratory introduces basic military skills.

101B Leadership: The Military Profession
Spring. 1(1-2) SA: MS 101 Not open to students with credit in MS 101A.

Introduction to military leadership and fundamental concepts of leadership. Application of leadership doctrine. The role of the U.S. Army, Army Reserves, and National Guard. Leadership laboratory introduces basic military skills.

102A Leadership: Wilderness Survival
Fall. 1(1-1) SA: MS 102 Not open to students with credit in MS 102B.

Introduction to wilderness survival including the psychology of survival, survival planning, and survival kits; shelters; water procurement; fire craft; field expedient weapons, tools, and equipment; desert, tropical, and cold weather survival; basic survival medicine; and food procurement.

102B Leadership: Wilderness Survival
Spring. 1(1-2) SA: MS 102 Not open to students with credit in MS 102A.

Introduction to wilderness survival including the psychology of survival, survival planning, and survival kits; shelters; water procurement; fire craft; field expedient weapons, tools, and equipment; desert, tropical, and cold weather survival; basic survival medicine; and food procurement.

201A Leadership: The Military Leader
Fall. 1(1-1) SA: MS 201 Not open to students with credit in MS 201B.

Introduction to effective leadership. Communications. Value of the United States Army. Responsibilities of military officers and professionalism. Laboratory includes tactics, marksmanship training, and military skills.

201B Leadership: The Military Leader
Spring. 1(1-2) SA: MS 201 Not open to students with credit in MS 201A.

Introduction to effective leadership. Communications. Value of the United States Army. Responsibilities of military officers and professionalism. Laboratory includes tactics, marksmanship training, and military skills.

202A Introduction to Land Navigation and Tactics
Fall. 1(1-1) SA: MS 202 Not open to students with credit in MS 202B.

Introduction to land navigation using military maps and lensatic compass. Planning routes using azimuth and distance. Determining location by terrain association and other methods. Introduction to infantry defensive and reconnaissance operations.

202B Introduction to Land Navigation and Tactics
Spring. 1(1-2) Not open to students with credit in MS 202A.

Introduction to land navigation using military maps and lensatic compass. Planning routes using azimuth and distance. Determining location by terrain association and other methods. Introduction to infantry defensive and reconnaissance operations.

301 Leading Small Organizations
Fall. 3(3-2) RB: (MS 101A or MS 101B) and (MS 102A or concurrently or MS 102B or concurrently) and (MS 201A or concurrently or MS 201B or concurrently) and (MS 202A or concurrently or MS 202B or concurrently) Completion of basic camp or boot camp. Must meet U.S. Army contracting requirements.

Skills required for military officers: communication, team building, delegating tasks, supervision, ethics, and physical fitness. Leading small units. Participation in physical fitness is required.

302 Leadership: Small Unit Tactics
Spring. 3(3-2) RB: (MS 301)

Basic military tactics and the military communication/orders process focusing on small units. Application of lessons learned from leadership case studies to practical exercises of leadership. Delegation of tasks and supervision of subordinates in a stressful environment.

401 Leadership: Training Management, Counseling, and Unit Management
Fall. 3(3-2) RB: (MS 302)

Army training philosophy. The lieutenant's role in training management, personnel administration, and logistics. Practical exercises in counseling and training presentations. Practical application of leadership development doctrine. Laboratory includes practical experience in unit administration and training management.

402 Military Law, Ethics and Professionalism
Spring. 3(3-2) RB: (MS 401)

Introduction of the military legal system and the Law of War. The basis of the military profession and the importance of ethical development to the profession of arms. Development of subordinates. Laboratory includes practical exercises in professional development and leadership opportunities.

490 Independent Study in Military Science
Fall, Spring. 1 to 4 credits. A student may earn a maximum of 4 credits in all enrollments for this course. R: Open only to juniors or seniors. Approval of department.

Individual research in areas related to military science.

MUSIC MUS

School of Music College of Arts and Letters

112 Chamber Music
Fall, Spring. 1(0-2) A student may earn a maximum of 10 credits in all enrollments for this course. R: Open only to students in the School of Music. Audition required.

Rehearsal and performance of a broad range of chamber music literature.