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  MMG AND MOLECULAR GENETICS

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 bioinformatics. 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.: (BS 111 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) 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) 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) 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. SA: MPH 426 Biogeochemistry. 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: (BMB 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 important 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) 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) 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.
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 Mi-  
crobiology and Molecular Genetics or Clini-  
cal Laboratory Sciences or Medical Tech-  
nology major or LBS Environmental Bio-  
logy/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 De-  
partment of Microbiology and Molecular Ge-  
etics 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 stu-  
dent 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(0-4) R: Open only to seniors in the  
Department of Microbiology and Molecular Ge-  
etics 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 physiol-  
ogy, 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 De-  
partment of Microbiology and Molecular Ge-  
etics 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 stu-  
dent 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 stu-  
dent 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 ma-  
jor 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 stu-  
dents with credit in MS 101B.  
Introduction to military leadership and fundamental  
concepts of leadership. Application of leadership  
discipline. The role of the U.S. Army, Army Reserves,  
and National Guard. Leadership laboratory intro-  
duces basic military skills.

101B Leadership: The Military Profession  
Spring. 1(1-2) SA: MS 101 Not open to stu-  
dents with credit in MS 101A.  
Introduction to military leadership and fundamental  
concepts of leadership. Application of leadership  
discipline. The role of the U.S. Army, Army Reserves,  
and National Guard. Leadership laboratory intro-  
duces basic military skills.

102A Leadership: Wilderness Survival  
Fall. 1(1-1) SA: MS 102 Not open to stu-  
dents with credit in MS 102A.  
Introduction to wilderness survival including the  
psychology of survival, survival planning, and sur-  
vival kits; shelters; water procurement; fire craft; field  
expedition 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 stu-  
dents with credit in MS 102A.  
Introduction to wilderness survival including the  
psychology of survival, survival planning, and sur-  
vival kits; shelters; water procurement; fire craft; field  
expedition 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 stu-  
dents with credit in MS 201A.  
Introduction to effective leadership. Communica-  
tions. Value of the United States Army. Responsibili-  
ties of military officers and professionalism. Labora-  
tory includes tactics, marksmanship training, and  
mental skills.

201B Leadership: The Military Leader  
Spring. 1(1-2) SA: MS 201 Not open to stu-  
dents with credit in MS 201A.  
Introduction to effective leadership. Communica-  
tions. Value of the United States Army. Responsibili-  
ties of military officers and professionalism. Labora-  
tory includes tactics, marksmanship training, and  
mental skills.

202A Introduction to Land Navigation and  
Tactics  
Fall. 1(1-1) SA: MS 202 Not open to stu-  
dents with credit in MS 202B.  
Introduction to land navigation using military maps  
and topographic maps. Planning routes using azi-  
muth 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 topographic maps. Planning routes using azi-  
muth 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 21B 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. Participa-  
tion in physical fitness is required.

302 Leadership: Small Unit Tactics  
Spring. 3(3-2) RB: (MS 301)  
Basic military tactics and the military communica-  
tion/orders process focusing on small units. Applica-  
tion 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 lead-  
ership development doctrine. Laboratory includes  
practical experience in unit administration and train-  
ing management.

402 Military Law, Ethics and Professionalism  
Spring. 3(3-2)  
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 devel-  
opment 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 enroll-  
ments for this course. R: Open only to jun-  
iors or seniors. Approval of department.  
Individual research in areas related to military sci-  
ence.

MUSIC MUS

School of Music  
College of Arts and Letters

112 Chamber Music  
Fall, Spring. 1(1-2) 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.