900. Special Problems
Fall, Winter, Spring, Summer. 2 credits. May reenroll for a maximum of 8 credits. Approval of department.

903. Microbiology I: General
Fall. 4(4-0) BCH 451 or concurrently.
Principles of microbiology emphasizing cell structure and function, metabolism, growth and death, differentiation, diversity, and microbial interaction.

904. General Microbiology Laboratory I
Fall. 3(1-5) MPH 303 or concurrently.
Techniques and procedures of general microbiology emphasizing the isolation and identification of bacteria, the qualitative aspects of growth and death, and bacterial interactions.

906. General Microbiology Laboratory II
Spring. 3(1-5) MPH 304.
Continuation of MPH 303 with emphasis on immunologic and genetic techniques and procedures.

310. Food Safety and Microbiology
Fall. 4(3-3) CEM 143 or concurrently or approval of department. Not open to students with credit in ESC 440. Internship with and administered by Food Science.
Effects of food handling, preparation and service on food safety. Microorganisms in foods, sanitation, food borne disease and food service regulations.

400H. Honors Research
Fall, Winter, Spring, Summer. 2 credits. May reenroll for a maximum of 8 credits. Approval of department.
A four-term research project with thesis.

Microbiology and Public Health — Descriptions of Courses

Microbiology and Public Health

College of Human Medicine

College of Natural Science

College of Osteopathic Medicine

College of Veterinary Medicine

200. Elementary Microbiology
Fall, Winter. 4(3-2) Three terms of Natural Science. Primarily for majors outside the College of Natural Science.
Description of bacteria and related forms of microorganisms, their growth and nature, their application in industry, and their control in public health.

234. Elementary Medical Microbiology
Fall. 3(4-4) CEM 130, BS 211, approval of department.
Survey of immunology and microbiology with emphasis on pathogenic microorganisms, anti-microbial agents, and laboratory diagnosis.

301. Introductory Microbiology
Fall, Spring, Summer. Given at W. K. Kellogg Biological Station Summer term. Fall, Spring. 3(0) Summer. 3 credits. CEM 242, CEM 244 or BCH 203.
Fundamentals of microbiology. Ranges of cell structure and activities; nutrition, growth, and importance of major microbial groups.

302. Introductory Microbiology Laboratory
Fall, Spring, Summer. Given at W. K. Kellogg Biological Station Summer term. Fall, Spring. 2(0-4) Summer. 2 credits. MPH 301 or concurrently.
Methodology of microbiology including microscopy, staining, asepsis, cultural media and quantification.

303. Microbiology II: Immunobiology/Cell Biology
Fall. 4(4-0) BCH 452 or concurrently.
Cell biology of eukaryotic cells with immune system as model. Emphasize structure-function relationships in subcellular organelles, antigen metabolism and regulatory mechanisms of immune responsiveness.

306. Medical Mycology
Fall, Spring. 4(2-6) BOT 402 or approval of department. Interdepartmental with and administered by the Department of Botany and Plant Pathology.
Characteristics, habits, and laboratory identification of fungus diseases infecting humans. Emphasis on laboratory techniques and morphological characteristics of the various mycoses.

407. Microbiology III: Microbial Genetics
Fall. 4(4-0) MPH 405; BCH 453 or concurrently.
Genetics and molecular biology of bacteria and viruses with emphasis on the genetic principles developed from their study.

413. Animal Cells and Viruses
Fall. 3(0) MPH 407.
Basic features of animal cell structure and function, and of animal viruses as tools to understand eukaryotic gene expression, as pathogens, and as examples of diversity and divergence with cellular mechanisms.

A-145
### Descriptions — Microbiology and Public Health of Courses

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>Credits</th>
<th>Duration</th>
<th>Departmental Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>410</td>
<td>General Parasitology</td>
<td>Fall, Summer</td>
<td>Given at W. K. Kellogg Biological Station, Summer term. Fall: 3(3-0) Summer: 3 credits. B S 210, B S 211, B S 212 or LBS 141. Interdepartmental with the Department of Zoology.</td>
<td>Life history, host-parasite relationships (including physiology, immunology, immunopathology and pathology) and epidemiology of selected groups and species of protozoan, trematode, cestode and nematode parasites.</td>
</tr>
<tr>
<td>418</td>
<td>General Parasitology Laboratory (MPH 417)</td>
<td>Fall, Summer</td>
<td>Given at W. K. Kellogg Biological Station Summer term. Fall: 2(0-4) Summer: 2 credits. MPH 416 or concurrently or approval of department. Interdepartmental with the Department of Zoology.</td>
<td>Identification and life histories of representative species of major groups of animal parasites. Selected concepts of host-parasite associations will be tested experimentally.</td>
</tr>
<tr>
<td>420</td>
<td>Biology of Animal Parasites</td>
<td>Summer</td>
<td>6 credits. B S 212 or approval of department. Given at W. K. Kellogg Biological Station.</td>
<td>Host-parasite relationships with emphasis on the interrelationships of host-parasite associations with the natural environments. Approved through Spring 1986.</td>
</tr>
<tr>
<td>421</td>
<td>Microbial Physiology</td>
<td>Fall</td>
<td>3(3-6) MPH 303, MPH 304, BCH 459.</td>
<td>Cell structure and function, macromolecular synthesis and control.</td>
</tr>
<tr>
<td>422</td>
<td>Microbial Physiology Laboratory</td>
<td>Fall</td>
<td>2(0-6) MPH 421 or concurrently.</td>
<td>Laboratory work based upon the subject matter of MPH 421.</td>
</tr>
<tr>
<td>426</td>
<td>Microbial Ecology</td>
<td>Spring</td>
<td>3(3-9) MPH 301 or MPH 308.</td>
<td>Microbial activities in natural ecosystems; their association with plants and animals, and their transformations of carbon, nitrogen and sulfur in soil and aquatic habitats.</td>
</tr>
<tr>
<td>429A</td>
<td>Microbial Ecology Recitation</td>
<td>Spring</td>
<td>1(1-4) MPH 426 concurrently.</td>
<td>Microbial activities in natural ecosystems; their association with plants and animals, and their transformations of carbon, nitrogen and sulfur in soil and aquatic habitats.</td>
</tr>
<tr>
<td>450</td>
<td>Infectious Disease Clerkship</td>
<td>Fall, Winter, Spring, Summer</td>
<td>1 to 6 credits. May renew for a maximum of 12 credits. Approval of department.</td>
<td>Tutorial instruction in laboratory or library research for advanced undergraduates. Integrated basic science input is afforded through relevant seminars.</td>
</tr>
<tr>
<td>461</td>
<td>Medical Immunology and Microbiology</td>
<td>Winter</td>
<td>2(0-6) MPH 481 or concurrently.</td>
<td>Basic immunologic and taxonomic laboratory techniques of selected bacterial pathogens.</td>
</tr>
<tr>
<td>464</td>
<td>Environmental Microbiology</td>
<td>Winter</td>
<td>2(0-6) MPH 481 or concurrently.</td>
<td>Basic immunologic and taxonomic laboratory techniques of selected bacterial pathogens.</td>
</tr>
<tr>
<td>470</td>
<td>Biological Membranes</td>
<td>Spring</td>
<td>3(3-6) BCH 401.</td>
<td>Intermolecular and intramolecular interactions of cell membranes and membranous organelles are compared. A brief discussion of theoretical and experimental models is included.</td>
</tr>
<tr>
<td>490</td>
<td>Special Problems in Microbiology</td>
<td>Fall, Winter, Spring, Summer</td>
<td>1 to 6 credits. May renew for a maximum of 12 credits. Approval of department.</td>
<td>Tutorial instruction in laboratory or library research for advanced undergraduates.</td>
</tr>
<tr>
<td>503</td>
<td>Introduction to Medical Biology</td>
<td>Fall</td>
<td>3(3-6) MPH 530.</td>
<td>Principles of medical biology for medical students.</td>
</tr>
<tr>
<td>511</td>
<td>Medical Microbiology and Immunology</td>
<td>Winter</td>
<td>1 to 5 credits. May renew for a maximum of 5 credits. Approval of department.</td>
<td>Basic principles of microbiology (bacteriology, virology, mycology and parasitology) and immunology. Selected type-infections relate these principles to disease in humans.</td>
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</table>

### 512. Infectious Diseases

<table>
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</tr>
</thead>
<tbody>
<tr>
<td>512</td>
<td>Infectious Diseases</td>
<td>Spring</td>
<td>4(3-3) MPH 512, or approval of department. Interdepartmental with the Department of Medicine.</td>
<td>Infectious diseases of humans, including biology of the causative microorganisms, epidemiology, pathogenesis, host-parasite relationships, clinical and laboratory diagnosis, and clinical management.</td>
</tr>
</tbody>
</table>

### 521. Medical Microbiology and Immunology

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</thead>
<tbody>
<tr>
<td>521</td>
<td>Medical Microbiology and Immunology</td>
<td>Winter</td>
<td>1 to 6 credits. May renew for a maximum of 6 credits. A biochemistry course. Enrollment in College of Osteopathic Medicine or approval of department.</td>
<td>Basic principles of microbiology (bacteriology, virology, mycology and parasitology) and immunology. Selected type-infections relate these principles to disease in humans.</td>
</tr>
</tbody>
</table>

### 531A. Medical Microbiology: Immunology

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</thead>
<tbody>
<tr>
<td>531A</td>
<td>Medical Microbiology: Immunology</td>
<td>Winter</td>
<td>4(3-2) Second-term Veterinary Medicine students or approval of department.</td>
<td>Basic principles of immunology, immunobiology and immunohematology and their relation to disease in animals.</td>
</tr>
</tbody>
</table>

### 531B. Medical Microbiology: Bacteriology and Mycology

<table>
<thead>
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</tr>
</thead>
<tbody>
<tr>
<td>531B</td>
<td>Medical Microbiology: Bacteriology and Mycology</td>
<td>Spring</td>
<td>5(3-6) Third-term Veterinary Medicine students or approval of department.</td>
<td>Basic principles of bacteriology and mycology and their relation to disease in animals.</td>
</tr>
</tbody>
</table>

### 531C. Medical Microbiology: Virology

<table>
<thead>
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</tr>
</thead>
<tbody>
<tr>
<td>531C</td>
<td>Medical Microbiology: Virology</td>
<td>Fall</td>
<td>3(3-2) Fourth-term Veterinary Medicine students or approval of department.</td>
<td>General properties of animal viruses; pathogenesis, immune response and immunopathogenesis in viral diseases; principles of clinical virology.</td>
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</tbody>
</table>

### 531D. Medical Microbiology: Parasitology

<table>
<thead>
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</tr>
</thead>
<tbody>
<tr>
<td>531D</td>
<td>Medical Microbiology: Parasitology</td>
<td>Winter</td>
<td>4-3-5 Fifth-term Veterinary Medicine students or approval of department.</td>
<td>Basic principles of parasitology (protozoology, helminthology, and entomology) and their relation to disease in animals.</td>
</tr>
</tbody>
</table>

### 615. Infectious Disease Clerkship

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</thead>
<tbody>
<tr>
<td>615</td>
<td>Infectious Disease Clerkship</td>
<td>Fall, Winter, Spring, Summer</td>
<td>2 to 12 credits. May renew for a maximum of 12 credits.</td>
<td>Tutorial instruction in laboratory or library research for advanced undergraduates.</td>
</tr>
</tbody>
</table>

### 800. Seminar

<table>
<thead>
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</thead>
<tbody>
<tr>
<td>800</td>
<td>Seminar</td>
<td>Fall, Winter, Spring</td>
<td>1(1-0)</td>
<td>May renew for a maximum of 9 credits. Approval of department.</td>
</tr>
</tbody>
</table>

### 510. Topics in Microbiology

<table>
<thead>
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</tr>
</thead>
<tbody>
<tr>
<td>510</td>
<td>Topics in Microbiology</td>
<td>Fall, Winter, Spring</td>
<td>2 to 4 credits. May renew for a maximum of 10 credits if different topic is taken. Approval of department.</td>
<td>Topics will be selected from taxonomic subdisciplines such as bacteriology, virology, protozoology, mycology, and helminthology from transdepartmental disciplines such as microbiological genetics, immunology, physiology, and ecology.</td>
</tr>
</tbody>
</table>

### 813. Molecular Virology

<table>
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</thead>
<tbody>
<tr>
<td>813</td>
<td>Molecular Virology</td>
<td>Winter</td>
<td>4(4-0) Background in biochemistry, and approval of department.</td>
<td>Molecular nature and biochemistry of replication of bacterial and animal viruses. Emphasis is on current advanced research concepts, and the role of viruses in molecular biology research.</td>
</tr>
</tbody>
</table>
821. Advanced Microbial Physiology
Spring of even-numbered years. 4(4-0)
MPH 302.
Mechanism and regulation of physiologic and metabolic activities unique to procaryotes including fermentation, photosynthesis, respiration and autotrophy.

822. Microbial Genetics
Winter. 3(0-0) BCH 811.
Gene structure, gene function, and genetic regulation at the classical and molecular levels in procaryotes and lower eukaryotes.

827. Immunology
Spring of even-numbered years. 3(3-0)
MPH 405; BCH 452 or ZOL 441; CSM 385 recommended.
Structure and reactivity of antigens and antibodies, synthesis of immunoglobulins. Emphasis on current advances and research concepts.

829. Host-Parasite Relationships
Fall. 3(0-0) MPH 427, MPH 428 or approval of department.
Pathogenesis and host responses to selected bacterial, parasitic, and fungal pathogens. Emphasis is on current research models which exemplify a variety of host-parasite relationships.

831. Bacterial Diversity
Spring of odd-numbered years. 3(3-0)
MPH 303, MPH 304, BCH 401 or BCH 453 or concurrently.
Morphological and physiological properties of diverse groups of bacteria and how these properties relate to their ecological niche and importance.

832. Bacterial Diversity Laboratory
Spring of odd-numbered years. 2(0-6)
MPH 831 or concurrently.
Representative groups of bacteria will be isolated and studied.

842. Advanced Soil Microbiology
Fall of odd-numbered years. 3(3-0)
MPH 425 or approval of department. Interdepartmental with the Department of Crop and Soil Sciences.
Biochemistry, biology, and community ecology of microorganisms indigenous to soil. Emphasis on current research problems.

843. Soil Microbiology Laboratory
Fall of odd-numbered years. 2(0-6)
MPH 842 concurrently or approval of department. Interdepartmental with the Department of Crop and Soil Sciences.
Fundamental techniques of dealing with microorganisms indigenous to soil. Metabolic activity of microorganisms. Interaction between microorganisms and plants.

890. Special Problems in Microbiology
Fall, Winter, Spring, Summer. 2 to 6 credits. May reenroll for a maximum of 12 credits. Approval of department.

899. Master's Thesis Research
Fall, Winter, Spring, Summer. Variable credit. Approval of department.

900. Topics in Microbiology
Fall, Winter, Summer. 2(2-0)
May reenroll if different topic is taken. Approval of department.
Topics will be selected from taxonomic subdisciplines such as bacteriology, virology, protozoology, mycology, algology, and helminthology; and from transecting disciplines such as microbial genetics, immunology, physiology, and ecology.

999. Doctoral Dissertation Research
Fall, Winter, Spring, Summer. Variable credit. Approval of department.

MILITARY SCIENCE

Office of the Provost

101. Introduction to the Military Profession
(M S 121) Fall, Winter, Spring. 1(1-1)
Approval of department.
Introduction to the military profession from several academic perspectives. Exploration of the technical, ethical, and personal ramifications of service as an officer in the U.S. Army. Lab introduces military skills.

102. Military Leadership I
(M S 041A.) Winter. 1(1-1) M S 101 or approval of department.
Introduction to military leadership. Draws upon examples from military history to illustrate what a military leader must be, know, and do to lead soldiers in battle. Lab includes both military skills and leadership applications.

103. Army Physical Fitness Training
Spring. 1(0-3) M S 102 or approval of department.
The leader's role in implementing the Army Physical Fitness Program to provide for the physical well being of subordinates. Individual and group fitness programs are introduced. Includes rappelling and small bore rifle marksmanship.

201. Military First Aid
(M S 221.) Fall. 1(1-1) M S 103 or approval of department.
Emergency first aid techniques including casualty evaluation, lifesaving measures, CPR, and environmental injury prevention. Lab includes military skills and first aid applications.

202. Military Leadership II
(M S 041B.) Winter. 1(1-1) M S 201 or approval of department.
Descriptive model of small unit leadership. Provides cadets with a realistic preview of the small unit leader's role in the Army. Lab includes small unit drill and ceremonies.

203. Land Navigation
(M S 223.) Spring. 1(1-2) M S 302 or approval of department.
Use of topographic and special use maps to include intersection, resection, modified resection, and polar coordinates. Development of overlays for tactical operations. Lab includes actual land navigation in the field using the compass.

301. Command and Control Communications
Fall. 3(2-0) M S 303 or approval of department.
Tactical wire and radio communications systems and employment during tactical operations to provide effective control of military operations. Encryption/decryption, use of codes, and electronic warfare. Lab emphasizes practical application of communication skills.

302. Military Leadership III
Winter. 2(3-3) M S 301 or approval of department.
Application of the theories and models of the behavioral sciences to leadership as it functions in a military environment. Case studies from military history. Lab emphasizes practical leadership applications.

303. Small Unit Tactics
(M S 325.) Spring, 3(2-3) M S 302 or approval of department.
Offensive and defensive military tactics. Incorporates practical exercises which allow cadets to view the modern battlefield through the eyes of the infantry platoon leader. Lab emphasizes tactical employment of the infantry squad and platoon.

401. Training Management and Unit Administration
(M S 426.) Fall. 3(2-2) M S 303 or approval of department.
The Army training management system and the leader's role as a trainer. Operations and administration in military units to provide effective personnel management and logistic support. Oral and written military communication. Lab includes practical exercises in unit administration.

402. Military Leadership IV
(M S 401D.) Winter. 3(2-2) M S 401 or approval of department.
Leadership assessment, development, and training practices. Integration of theory, practice, and self-assessment in leadership. Development of subordinates and the role of the noncommissioned officer. Lab includes leadership development and assessment exercises.

403. Military Law, Ethics, and Professionalism
(M S 427.) Spring. 3(2-2) M S 402 or approval of department.
Military legal system and the responsibilities of leaders in the application of military justice. Examination of fundamental values and principles of conduct in the profession of arms. Lab includes practical exercises in professional development.

499. Independent Study in Military Science
Fall, Winter, Spring, Summer. 1 to 3 credits. May reenroll for a maximum of 6 credits. Approval of department.
Individual research and study in an area related to military science as approved and directed by the Department of Military Science.

MUSIC

College of Arts and Letters

112. Chamber Music
Fall, Winter, Spring, Summer. 1(1-0)
May reenroll for a maximum of 18 credits. Approval of department.
Performance of works for small ensembles.

118. Band
A. Marching Band
Fall. 1 credit. May reenroll for credit.
Membership determined by audition.
The Marching Band participates at football games.