901. Microbiology
Fall, Winter, Spring. 3 credits. MTH 422, BCH 452 or approval of department.

902. Advanced Topical Seminar
Fall, Winter, Spring. 3 credits. MTH 422 or approval of department.

903. Special Problems
Fall, Winter, Spring. 1 to 6 credits. May enroll for a maximum of 9 credits. Approval of department.

904. Elastic Thin Shells
Spring. 3(3-0) MMM 815 or C E 804 or approval of department, MTH 421. Interdepartmental with and administered by Civil Engineering.

905. Theory of Elastic Stability
Fall, Winter, Spring. 3(3-0) MMM 815 or approval of department.

906. Theory of Plates
Winter. 3(3-0) MMM 815 or C E 804 or approval of department, MTH 422. Interdepartmental with Civil Engineering.

907. Theory of Elasticity II
Spring. 3(3-0) MMM 813 or approval of department.

910. Nonlinear Continua
Winter of even-numbered years. 4(4-0) MMM 810.

911. Theory of Elastic Stability
Fall of odd-numbered years. 4(4-0) MMM 815 or approval of department.

912. Theory of Plates
Winter. 4(4-0) MMM 815 or C E 804 or approval of department, MTH 422. Interdepartmental with Civil Engineering.

913. Theory of Viscoelasticity
Fall of even-numbered years. 3(3-0) C E 804 or approval of department, MTH 422. Interdepartmental with Civil Engineering.

914. Theory of Vibrations I
Fall of odd-numbered years. 4(4-0) MTH 422, MTH 421 or approval of department. Interdepartmental with the Department of Mechanical Engineering.

915. Theory of Elasticity II
Spring. 3(3-0) MMM 813 or approval of department.

916. Theory of Vibrations II
Winter of odd-numbered years. 4(4-0) MTH 422, ME 820 or approval of department. Interdepartmental with the Department of Mechanical Engineering.

917. Theory of Vibrations III
Spring of odd-numbered years, Summer. 4(4-0) MMM 920 or approval of department. Interdepartmental with the Department of Mechanical Engineering.

918. Theory of Viscoelasticity
Fall of even-numbered years. 3(3-0) C E 804 or approval of department, MTH 422. Interdepartmental with Civil Engineering.

919. 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(4-2) Three terms of Natural Science. Primarily for majors outside the College of Natural Science.

201. Introductory Microbiology
Fall, Winter. 3(3-0) CEM 242, CEM 244 or BCH 200.

202. Introductory Biochemistry
Fall, Winter, Spring. 3(3-0) CEM 242, CEM 244 or BCH 200.

203. Advanced Topics in the Kinetics of Phase Transformation
Fall of odd-numbered years. Winter and Spring of even-numbered years. 3(3-0) May reenroll for a maximum of 9 credits.

204. Advanced Topics in the Kinetics of Phase Transformation
Fall of odd-numbered years. Winter and Spring of even-numbered years. 3(3-0) May reenroll for a maximum of 9 credits.

301. Introductory Microbiology
Fall, Winter, Spring. 3(3-0) CEM 242, CEM 244 or BCH 200.

302. Introduction to Microbiology
Fall, Winter. 4(4-4) MPH 301 or concurrently.

303. Introduction to Microbiology
Fall, Winter, Spring. 3(3-0) CEM 242, CEM 244 or BCH 200.

304. Introduction to Microbiology
Fall, Winter, Spring. 3(3-0) CEM 242, CEM 244 or BCH 200.

305. Introduction to Microbiology
Fall, Winter, Spring. 3(3-0) CEM 242, CEM 244 or BCH 200.

306. Introduction to Microbiology
Fall, Winter, Spring. 3(3-0) CEM 242, CEM 244 or BCH 200.

307. Introduction to Microbiology
Fall, Winter, Spring. 3(3-0) CEM 242, CEM 244 or BCH 200.

308. Introduction to Microbiology
Fall, Winter, Spring. 3(3-0) CEM 242, CEM 244 or BCH 200.

309. Introduction to Microbiology
Fall, Winter, Spring. 3(3-0) CEM 242, CEM 244 or BCH 200.

310. Introduction to Microbiology
Fall, Winter, Spring. 3(3-0) CEM 242, CEM 244 or BCH 200.

311. Introduction to Microbiology
Fall, Winter, Spring. 3(3-0) CEM 242, CEM 244 or BCH 200.

312. Introduction to Microbiology
Fall, Winter, Spring. 3(3-0) CEM 242, CEM 244 or BCH 200.

313. Introduction to Microbiology
Fall, Winter, Spring. 3(3-0) CEM 242, CEM 244 or BCH 200.

314. Introduction to Microbiology
Fall, Winter, Spring. 3(3-0) CEM 242, CEM 244 or BCH 200.

315. Introduction to Microbiology
Fall, Winter, Spring. 3(3-0) CEM 242, CEM 244 or BCH 200.

316. Introduction to Microbiology
Fall, Winter, Spring. 3(3-0) CEM 242, CEM 244 or BCH 200.

317. Introduction to Microbiology
Fall, Winter, Spring. 3(3-0) CEM 242, CEM 244 or BCH 200.

318. Introduction to Microbiology
Fall, Winter, Spring. 3(3-0) CEM 242, CEM 244 or BCH 200.

319. Introduction to Microbiology
Fall, Winter, Spring. 3(3-0) CEM 242, CEM 244 or BCH 200.

320. Introduction to Microbiology
Fall, Winter, Spring. 3(3-0) CEM 242, CEM 244 or BCH 200.
421. Microbiological Physiology Laboratory
Fall, Winter. 2(0-0) MPH 421 or concurrently.
Laboratory work based upon the subject matter in MPH 421.

424. Microbiological Genetics Laboratory
Spring. 2(0-0)
Laboratory work in microbial genetics.

425. Microbiological Ecology
Spring. 4(4-0) MPH 301 or approval of department.
Fundamental concepts of microbial ecology. Emphasis will be placed on aquatic and soil habitats.

427. Immunobiology
Winter. 3(3-0) B S 212; BCH 200 or BCH 401.
Biological and biochemical mechanisms of the immune response. Emphasis is on concepts of immunity.

428. Immunobiology Laboratory
Winter. 2(0-0) MPH 427 or concurrently.
Basic laboratory techniques in immunobiology.

429. Microbiology of Infectious Diseases
Spring, 5(2-8) MPH 392, MPH 427.
Biological, immunological, pathogenicity, and medical aspects of microorganisms associated with infectious diseases of man. Methods of isolation and identification are emphasized in the laboratory.

431. Bacterial Diversity
Spring. 5(3-4) MPH 421.
Morphological and physiological properties of diverse groups of bacteria, and how these properties relate to their ecological niche and importance. Representative groups will be isolated and characterized.

437. Introductory Medical Parasitology Laboratory
Fall, Winter. 21-1; MPH 416 or concurrently or approval of department. Primarily for Medical Technology students.
Laboratory diagnosis of protozoon, helminth, and arthropod infections of man.

440. Food Microbiology
Fall. Dietetics majors only. Spring. 3(3-4) MPH 200 or MPH 301 or approval of department. Interdepartmental with and administered by Food Science.
Major groups of microorganisms of importance to the food industry are studied with emphasis on ecological, physiological, and public health aspects.

442. Soil Microbiology
Spring. 3(3-0) MPH 200 or MPH 301.
Interdepartmental with the Department of Crop and Soil Sciences.
Major groups of microorganisms of importance in soils are studied with emphasis on ecological, biochemical, and physical aspects.

444. Environmental Microbiology
Spring. 3(2-4) MPH 200 or MPH 301.
Flora, microflora of testing, and purification of environmental air and water. Treatment and disposal of sewage.

1DC. Biological Membranes
For course description, see Interdisciplinary Courses.

490. Special Problems in Microbiology
Fall, Winter, Spring. Summer. 1 to 6 credits. May reenroll for a maximum of 12 credits. Approval of Department.
Tutorial instruction in laboratory or library research for advanced undergraduates.

511. Medical Microbiology and Immunology
Spring. 1 to 2 credits. May reenroll for a maximum of 6 credits. A biochemistry course. Enrollment in College of Human Medicine or approval of department.
Basic principles of microbiology (bacteriology, virology, mycology and parasitology) and immunology. Selected type-infections relate these principles to disease in man.

512. Infectious Diseases
Fall. 4(2-0) MPH 511, or approval of department. Interdepartmental with the Department of Medicine.
Infectious diseases of man, including biology of the causative microorganism, epidemiology, pathogenesis, host-parasite relationships, clinical and laboratory diagnosis, and clinical management.

521. Medical Microbiology and Immunology
Winter. Variable credit. May reenroll for a maximum of 6 credits. A biochemistry course. Enrollment in College of Osteopathic Medicine or approval of department.
Basic principles of microbiology (bacteriology, virology, mycology and parasitology) and immunology. Selected type-infections relate these principles to disease in man.

531A. Medical Microbiology: Immunology
Winter. 3-4 credits (Fall). A course in biochemistry and admission to the veterinary professional program, or approval of department.
Basic principles of immunology (immunobiology and immunohemotology) and their relation to disease in animals.

531B. Medical Microbiology: Bacteriology and Mycology
Winter. 3(2-4) A course in biochemistry and admission to the veterinary professional program, or approval of department.
Basic principles of bacteriology and mycology and their relation to disease in animals.

531C. Medical Microbiology: Virology
Spring. 2(1-2) A course in biochemistry and admission to the veterinary professional program, or approval of department.
Basic principles of virology and their relation to disease in animals.

531D. Medical Microbiology: Parasitology
Spring. 3(2-4) Admission to the veterinary professional program, or approval of department.
Basic principles of parasitology (protozoology, helminthology, and entomology) and their relation to disease in animals.

618. Infectious Disease Clerkship
Fall, Winter, Spring, Summer. 1 to 17 credits. May reenroll for a maximum of 34 credits. B M 602 and MED 605 or B D 606, Interdepartmental with and administered by the Department of Medicine.
The clerkship emphasizes acquisition of knowledge and skills essential in solution of clinical problems in infectious and immunologic diseases. Integrated basic science input is afforded through relevant seminars.

800. Seminar
Fall, Winter, Spring, Summer. 1(1-0)
May reenroll for a maximum of 9 credits. Approval of department.

810. Topics in Microbiology
Fall, Winter, Spring, Summer. 2 to 4 credits. May reenroll for a maximum of 10 credits if different topic taken. Approval of department.
Topics will be selected from taxonomic subclasses such as bacteriology, virology, immunology, mycology, and helminthology; from transdisciplinary disciplines such as microbial genetics, immunology, physiology, and ecology.

821. Advanced Microbiological Physiology and Genetics
Fall. 4(4-0) MPH 421.
Mechanism and regulation of physiologic and metabolic activities unique to prokaryotes: fermentation, photosynthesis, respiration; autotrophy; micro- and macro-molecular synthesis, cell division, membrane processes, gene transfer, recombination, and DNA repair.

826. Ecology of Animal Parasites
Summer. 3 credits. MPH 416, approval of department. Given at W. Kellogg Biological Station.
Interaction of parasitic animals (protozoa, helminths, and arthropods) with their natural environment, including host, biotic and physical aspects.

827. Immunobiology
Spring. 3(3-0) MPH 427; BCH 452, or ZOL 441, and CEM 383 recommended.
Structure and reactivity of antigens and antibodies; synthesis of immunoglobulins. Emphasis is on current advances and research concepts.

828. Immunobiology Laboratory
Spring. 2(0-0) MPH 427; MPH 827 or concurrently.
Laboratory based partially on subject matter of MPH 827. Experimental techniques used in immunological assays and immune systems.

829. Host-Parasite Relationships
Fall. 3(3-0) MPH 427; MPH 429 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.

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

900. Topics in Microbiology
Fall, Winter, Spring, 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, virology, and entomology and from transacting disciplines such as microbial genetics, immunology, physiology, and ecology.

901. Experimental Microbiology
Fall, Winter, Spring, Summer. 3(0-6)
May reenroll for a maximum of 9 credits. Approval of department.
Experiments, demonstrations, and discussions of current research problems in various areas of microbiology.

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

MILITARY SCIENCE

All University

041. General Military Science
Application of leadership techniques, the decision making process and staff planning. Military customs and traditions. Students will concurrently enroll in a selected non-Military Science course to fulfill military professional requirements.

A. Military Traditions-M S I
Winter. 0(0-1) Approval of department.
B. Evolution of Military Leadership-M S II
Fall. 0(0-1) Approval of department or M S II standing. HST 235 concurrently.
C. Military Career Preparation-M S III
Spring. 0(0-1) Approval of department or M S III standing.
D. Advanced Camp Preparation-M S III
Winter. 0(0-1) Approval of department or M S III standing.
E. Military Staff Organization-M S IV
Fall. 0(0-1) Approval of department or M S IV standing.

131. Preview of Military Science
Fall, Winter, Spring. Summer. 1(1-0) Approval of department.
Role of the ROTC officer in the Army. Assists the student in planning a curriculum to satisfy requirements for a commission.

132. Marksmanship and Hunter Safety
Fall, Spring. 1(0-2) M S 121 or approval of department.
Small arms marksmanship and safety. Practical exercises on local firing ranges. Individual basic military marksmanship and the skills necessary to participate in a competitive or recreational shooting program.

223. Terrain Analysis and Land Navigation
Fall, Winter, Spring. 3(3-0) M S 121 and approval of department.
Military maps, map construction, specifications and uses. Includes both study of aerial photographs and an introduction to remote energy sensors employed by defense agencies as they relate to tactical operations.

324. Military Teaching
Fall, Winter, 4(4-2) Basic course, approval of department.
Methods of teaching manipulative skills to groups with varying educational backgrounds. Emphasis on determination of entry behavior, progress analysis, testing and test construction. Introduction to current teaching aids. Practical experience in simulated field situations is stressed during laboratory.

325. Military Management
Spring. 4(3-2) M S 324 or approval of department.
Task analysis approach to missions. The subject of tactics is used as a teaching vehicle for the managerial approach to the preparation and execution phases of military operations. Emphasis is placed on physical and moral leadership during the laboratory sections.

426. Military Law
Winter. 4(4-0) Approval of department.
Jurisdiction and responsibility of the Army commander and junior leader in the application of military justice. Implications of Army operations as related to the rules of war.

427. Seminar
Spring. 1(1-0) Approval of department.
Precommissioning orientation stressing current military policies, procedures, customs and trends.

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 and juniors.
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

100. Theory Review
Fall, Summer. 2(2-1) For majors who need theory review.
Basic course in fundamentals and ear training.

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.

B. Spartan Brass
Winter. 1 credit. May reenroll for credit. Membership determined by audition.
The Spartan Brass performs at basketball games.

C. Concert Band
Fall, Winter, Spring. 1 credit. May reenroll for credit. Membership determined by audition.
Public appearances are scheduled on campus each term.

D. Symphonic Band
Fall, Winter, Spring. 1 credit. May reenroll for a maximum of 12 credits. Membership determined by audition. A high level of achievement in performing ability is required.
Concerts are scheduled both on and off campus.

E. Wind Ensemble
Fall, Winter, Spring. 1 credit. May reenroll for a maximum of 12 credits. Membership determined by audition.
Full range of wind literature is performed. Public concerts are presented both on and off campus.

135. Music in Elementary Education
Fall, Winter, Spring, Summer. 4(3-3)
Elementary education majors.
Basic, scope and sequence of music instruction in the elementary school with an introduction to basic knowledge and skills used in elementary school music.

141. Class Instruments and Voice
Fall, 1(0-2) Knowledge of notation. Music majors, or approval of department.
Class instruction in piano, voice, violin, cello, clarinet, and cornet.

142. Class Instruments and Voice
Winter. 1(0-2) MUS 141.
Continuation of MUS 141.

143. Class Instruments and Voice
Spring. 1(0-2) MUS 142.
Continuation of MUS 142.

145. Music Foundations I
Fall, Winter, Spring. 3(3-0) MUS 135 and approval of department.
Development of understanding and knowledge of music fundamentals, ear training, music reading, rhythm, and other basic music perceptions. Designed specifically for elementary classroom teachers who elect a strong concentration in music.

147. Elementary Piano
Fall, Winter, Spring. 2(2-2) MUS 145 or approval of department. Elementary Education and Physical Education and Recreation majors.
Beginning class piano instruction. Development of ability to play the three principal chords in all keys and to harmonize simple melodies using these chords. Transposition of simple melodies. Ability to play melodies and rhythms suitable for use in lower intermediate grades or in recreation work.