ment. Interdepartmental with the Mechanical Engineering Department.

Nonlinear oscillations. Resonance; subharmonics; self-sustained motions; stability. Methods of Poincare, van der Pol, etc. Random vibrations. Parametric excitations; stochastic processes; power spectra. Applications.

933. *Advanced Elasticity*

Spring of even-number years. 3(3-0) 813, 910 or approval of department.

Selected topics in non-linear elasticity.

941. *Advanced Topics in Mechanical Metallurgy*

Fall of even-numbered years; Winter and Spring of odd-numbered years. 3(3-0) May re-enroll for a maximum of 9 credits.

Various aspects of dislocation theory and its application to the mechanical and physical properties of solids.

942. *Advanced Topics in the Kinetics of Phase Transformation*

Fall of odd-numbered years; Winter and Spring of even-numbered years. 3(3-0) May re-enroll for a maximum of 9 credits.

999. *Research*

(EGR 999.) Fall, Winter, Spring Summer. Variable credit. Approval of department.

MICROBIOLOGY AND PUBLIC HEALTH MPH

College of Human Medicine
College of Natural Science
College of Osteopathic Medicine
College of Veterinary Medicine

100. *Preview of Microbiology*

Winter. 2(2-0) Freshmen and Sophomores only.

Science and scientists of microbiology, presented in historical perspective and carried to the forefront of current research. A rigorous preview for students seriously curious about microbiology.

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. 5(4-4) Three terms of Natural Science. Primarily for Nursing students.

Survey of immunology and microbiology with emphasis on pathogenic microorganisms, antimicrobial agents, and laboratory diagnosis.

301. *Introductory Microbiology*

Fall, Spring. 3(3-0) B S 212; BCH 200.

Fundamentals of microbiology with emphasis on the comparative nature of the various groups of microorganisms, their distribution and activities.

302. *Introductory Microbiology Laboratory*

Fall, Spring. 1(0-4) 301 or concurrently.

Laboratory based on the subject matter of 301.

400. *Bacteriology for High School Science*

Summer. 4(4-4) Bachelor's degree and teaching certificate.

Fundamental concepts, experiments, and projects useful in secondary school science courses.

400H. *Honors Work*

Fall, Winter, Spring, Summer. 1 to 6 credits. May re-enroll for a maximum of 12 credits. Approval of department.

Tutored reading and experimentation.

401. *General Microbiology*

Fall. 5(5-0) B S 212; BCH 401 or concurrently.

Comparative biology of microorganisms: viruses, rickettsiae, bacteria, fungi, algae, and protozoa.

402. *General Microbiology Laboratory*

Fall. 3(1-6) 401 or concurrently.

Laboratory based on the subject matter of 401.

413. *General Virology*

(463.) Winter. 3(3-0) 427 or concurrently.

Physical, chemical, and biological properties of the viruses.

414. *General Virology Laboratory*

Winter. 1(0-4) 413 or concurrently.

Laboratory procedures employed for cultivation and identification of viruses.

416. *General Parasitology*

(406.) Winter. Summer at W. K. Kellogg Biological Station. 3(2-4) B S 212.

Biology of parasitic animals.

421. *Microbial Physiology*

Winter. 3(3-0) 401, 402.

Cell structure and function, growth and death, and metabolism of microorganisms.

422. *Microbial Physiology Laboratory*

Winter. 2(0-6) 421 or concurrently.

Laboratory work based upon the subject matter in 421.

423. *Microbial Genetics*

(431.) Spring. 3(3-0) BCH 401; ZOL 441 recommended.

Fundamental genetic concepts as exemplified in microorganisms.

424. *Microbial Genetics Laboratory*

Spring. 2(0-6) 423 or concurrently.

Laboratory work based upon the subject matter in 423.

425. *Microbial Ecology*

Summer. 6(3-9) 402. Given at W. K. Kellogg Biological Station.

Lecture emphasizes biological and biochemical properties of diverse naturally occurring microorganisms. The laboratory stresses the analysis and description of natural metabolic activity. Methodology includes enrichment techniques but also qualitative and quantitative monitors of environmental changes.

427. *Immunobiology*

(460.) 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(0-6) 427 or concurrently.

Basic laboratory techniques in immunobiology.

429. *Microbiology of Infectious Diseases*

(461.) Spring. 5(2-8) 301 or 402 and 427.

Biology, immunology, pathogenicity, and medical aspects of microorganisms associated with infectious diseases of man. Methods of isolation and identification are emphasized in the laboratory.

436. *Introductory Medical Parasitology*

(309., 336.) Fall. 5(3-5) Primarily for Medical Technology students.

Biology and laboratory diagnosis of protozoan, helminth, and arthropod infections of man.

440. *Food Microbiology*

(371.) Spring. 4(2-6) 200 or 301 or 401. 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*

(481.) Spring. 4(3-4) 200 or 301 or 401. Interdepartmental with Soil Science.

Major groups of microorganisms of importance in soils are studied with emphasis on ecological, biochemical, and physical aspects.

444. *Environmental Microbiology*

(351.) Spring. 3(2-4) 200 or 301 or 401.

Flora, methods of testing, and purification of environmental air and water. Treatment and disposal of sewage.

511. *Medical Microbiology and Immunology*

Spring. Variable credit. May re-enroll for a maximum of 7 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. 3(3-0) 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 re-enroll 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*

(566., 531.) Winter. 2(1-2) A course in biochemistry and admission to the veterinary professional program, or approval of department.

Basic principles of immunology (immunobiology and immunochemistry) 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.

532. Veterinary Microbiology and Public Health

(567.) Winter. Summer. 8(5-11) 531 or approval of department.

Biology, immunology, pathogenicity, and medical aspects of microorganisms associated with infectious diseases of animals. Epidemiology of animal diseases significant to human health.

536. Veterinary Parasitology I

(501.) Winter, Summer. 4(3-4) Veterinary Medicine students or approval of department.

Distribution, biology, and control of parasitic animals of importance to veterinary medicine.

537. Veterinary Parasitology II

(502.) Fall, Spring. 4(2-6) 536 or approval of department.

Continuation of 536.

800. Seminar

(830.) Fall, Winter, Spring, Summer. 1(1-0).

813. Molecular Virology

Fall. 3(3-0) Background in biochemistry, and approval of department.

Molecular nature and biochemistry of replication of bacterial and animal viruses. Emphasis is on current advances, research concepts, and the role of viruses in molecular biology research.

816. Parasitic Metazoa

(802.) Spring of odd-numbered years. 4(3-4) 416 or ZOL 481 or approval of department.

Comparative biology, physiology, and host-parasite relationships of parasitic helminths and arthropods.

817. Parasitic Protozoa

(803.) Spring of even-numbered years. 3(2-4) 416 or ZOL 482 or approval of department.

Comparative biology, physiology, and host-parasite relationships of parasitic protozoa.

826. Ecology of Animal Parasites

Summer. 3 credits. 416, approval of department. Given at W. K. Kellogg Biological Station.

Interaction of parasitic animals (protozoa, helminths, and arthropods) with their natural environment, including host, biotic, and physical aspects.

827. Immunochemistry

Spring. 3(3-0) 427; 423, 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. Immunochemistry Laboratory

Spring. 2(0-6) 427; 827 or concurrently.

Laboratory based partially on subject matter of 827. Experimental techniques used in immunological assays and immune systems.

899. Research

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

900. Topics in Microbiology

Fall, Winter, Spring Summer. 2(2-0) May re-enroll if different topic is taken. Approval of department.

Topics will be selected from taxonomic subsciences such as bacteriology, virology, protozoology, mycology, algology, and helmintholo-gy; and from transecting disciplines such as microbial genetics, immunology, physiology, and ecology.

901. Experimental Microbiology

Fall, Winter, Spring, Summer. 3(0-9) May re-enroll for a maximum of 9 credits. Approval of department.

Experiments, demonstrations, and discussions of current research programs in various areas of microbiology.

999. Research

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

MILITARY SCIENCE M S

All University

041. General Military Science

Fall, Winter, Spring. Zero credit. Approval of department.

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 fulfil military professional requirements.

121. Preview of Military Science

Fall, Winter. 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.

122 Marksmanship and Hunter Safety

Fall, Spring. 1(0-2) 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

Winter, Spring. 3(3-0) 121 and approval of department.

Military maps, map construction, specifications and uses. Includes both a 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) 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.

Civilian and military law as they pertain to individuals and organizations associated with the Department of Defense.

427. Seminar

Spring. 1(1-0) Approval of department.

Precommissioning orientation stressing current military policies, procedures, customs and tends.

MUSIC MUS

College of Arts and Letters

094. Band

Summer. Zero credit. Membership determined by audition.

Attendance at all rehearsals and public concerts obligatory. See 118.

100. Theory Review

Fall, Summer. 2(3-2) For majors who need theory review.

Basic course in fundamentals and ear training.

112. Chamber Music

Fall, Winter, Spring, Summer. 1(1-0) May re-enroll for a maximum of 18 credits. Approval of department.

Performance of works for small ensembles.

118. Band

A. Marching Band.

Fall. 1 credit. May re-enroll for credit. Membership determined by audition.

The Marching Band participates at football games.

B. Spartan Brass

Winter. 1 credit. May re-enroll for credit. Membership determined by audition.

The Spartan Brass participates at basketball games.