

**Descriptions – Metallurgy, Mechanics and Materials Science
of
Courses**

- 881. Metals and Alloys II**
Winter. 3(3-0) MMM 372.
Similar to MMM 845, but with reference to non-ferrous alloys.
- 882. Metals and Alloys III**
Spring. 3(3-0) MMM 372.
Similar to MMM 845 but with reference to cast alloys.
- 885. Seminar**
Fall, Winter, Spring. 1 credit. MMM 899 concurrently.
- 890. Selected Topics**
Fall, Winter, Spring, Summer. 3(3-0)
May reenroll for a maximum of 18 credits if a different topic is taken. Approval of department.
A newly developing area in metallurgy, mechanics, or materials science selected by the department for offering each term. Information on the specific topic to be covered should be obtained from the department office before registration.
- 899. Research**
Fall, Winter, Spring, Summer. Variable credit. Approval of department.
- 900. Special Problems**
Fall, Winter, Spring, Summer. 1 to 6 credits. May reenroll for a maximum of 6 credits. Approval of department.
Individualized reading and research compatible with the student's interest and ability.
- 909. Elastic Thin Shells**
Spring. 4(4-0) MMM 815 or C E 804 or approval of department; MTH 421. Interdepartmental with and administered by Civil Engineering.
Elements of differential geometry, membrane theory of shells, Pucher's stress function, deformation and bending of shells of revolution and shallow shells.
- 910. Nonlinear Continua**
Winter of even-numbered years. 4(4-0) MMM 810.
Modern nonlinear theories of continua. Equations of balance and constitutive equations. Topics selected from finite elasticity, nonlinear viscosity and viscoelasticity, electroelasticity. General tensors are introduced and used throughout.
- 911. Theory of Elastic Stability**
Fall of odd-numbered years. 4(4-0) MMM 815 or approval of department.
Theory and methods of determining buckling strength and post-buckling behavior of bar, plate and shell elements and of elastic systems.
- 912. Theory of Plates**
Winter. 4(4-0) MMM 815 or C E 804 or approval of department; MTH 422. Interdepartmental with Civil Engineering.
Bending of thin elastic plates with various shapes and boundary conditions; application of energy principles and approximate methods of solution; thick plates; large deflection theory; sandwich plates.
- 915. Theory of Elasticity II**
Spring. 3(3-0) MMM 813 or approval of department.
Saint-Venant bending and torsion. Problems in three-dimensional linear elasticity using the Galerkin vector and Neuber-Papkovich functions.

- 918. Theory of Viscoelasticity**
Fall of even-numbered years. 3(3-0) MMM 810; MTH 422 or approval of department.
Fundamental linear viscoelastic stress-strain relations. Model representation. Three dimensional and general deformation laws. Correspondence principle. Quasi-static, dynamic and buckling problems.
- 920. Theory of Vibrations II**
Winter of odd-numbered years. 4(4-0) MTH 422; M E 823 or approval of department. Interdepartmental with the Department of Mechanical Engineering.
Vibrations of one, two, and three dimensional models of elastic and inelastic continua. Interaction phenomena. Stability. Variational methods. Applications to aeronautics, aerospace, and undersea technology.
- 921. 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.
Nonlinear oscillations. Resonance; subharmonics; self-sustained motions; stability. Methods of Poincare, van der Pol, etc. Random vibrations. Parametric excitations; stochastic processes; power spectra. Applications.
- 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 reenroll for a maximum of 9 credits.
- 999. Research**
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**

- 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) CEM 130, B S 211, approval of department.
Survey of immunology and microbiology with emphasis on pathogenic microorganisms, antimicrobial agents, and laboratory diagnosis.
- 301. Introductory Microbiology**
Fall, Winter, Spring. 3(3-0) CEM 242, CEM 244 or BCH 200.
Fundamentals of microbiology. Ranges of cell structure and activities; nutrition, growth, and importance of major microbial groups.
- 302. Introductory Microbiology Laboratory**
Fall, Winter, Spring. 2(0-4) MPH 301 or concurrently.
Methodology of microbiology including microscopy, staining, asepsis, cultural media and quantification.
- 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 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.
- 406. 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.
- 413. General Virology**
Winter. 3(3-0) MPH 427 or concurrently.
Physical, chemical, and biological properties of the viruses.
- 414. General Virology Laboratory**
Winter. 1(0-4) MPH 413 or concurrently.
Laboratory procedures employed for cultivation and identification of viruses.
- 416. General Parasitology**
Fall. 3(3-0) B S 210, B S 211, B S 212 or LBC 141.
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.
- 417. General Parasitology Laboratory**
Fall. 2(0-4) MPH 416 or concurrently or approval of department.
Identification and life histories of representative species of major groups of animal parasites. Selected concepts of host-parasite associations will be tested experimentally.
- 420. Ecology of Animal Parasites**
Summer. 6 credits. B S 212 or approval of department. Given at W. K. Kellogg Biological Station. Interdepartmental with the departments of Fisheries and Wildlife, and Zoology.
Parasitism of animals by protozoa, helminths and arthropods with emphasis on the interrelationships of host-parasite associations with the natural environments.
- 421. Microbial Physiology and Genetics**
Winter. 4(4-0) MPH 301, MPH 302; BCH 401 or BCH 452 or concurrently.
Cell structure and function, macromolecular synthesis and control, genetic capabilities of microorganisms.

422. Microbial Physiology Laboratory
Winter. 2(0-6) MPH 421 or concurrently.

Laboratory work based upon the subject matter in MPH 421.

424. Microbial Genetics Laboratory
Spring. 2(0-6)

Laboratory work in microbial genetics.

425. Microbial 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(0-6) MPH 427 or concurrently.

Basic laboratory techniques in immunobiology.

429. Microbiology of Infectious Diseases
Spring. 5(2-8) MPH 302, MPH 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.

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. 2(1-4) MPH 416 or concurrently or approval of department. Primarily for Medical Technology students.

Laboratory diagnosis of protozoan, helminth, and arthropod infections of man.

440. Food Microbiology
Fall, Dietetics majors only. Spring. 5(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, methods of testing, and purification of environmental air and water. Treatment and disposal of sewage.

IDC. 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 6 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(3-3) 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. 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.

618. Infectious Disease Clerkship
Fall, Winter, Spring, Summer. 1 to 17 credits. May reenroll for a maximum of 34 credits. H M 602 and MED 608 or H D 608. Interdepartmental with and administered by the Department of Medicine.

The clerkship emphasizes acquisition in depth 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 is taken. Approval of department.

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

813. Molecular Virology
Fall. 4(4-0) 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.

821. Advanced Microbial 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. 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) 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. Immunochemistry Laboratory
Spring. 2(0-6) 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.

**Descriptions – Microbiology and Public Health
of
Courses**

899. 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 subsciences such as bacteriology, virology, protozoology, mycology, algology, and helminthology; and from transecting disciplines such as microbial genetics, immunology, physiology, and ecology.

901. Experimental Microbiology
Fall, Winter, Spring, Summer. 3(0-9)
May reenroll 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.

223. Terrain Analysis and Land Navigation
Winter, Spring. 3(3-0) M S 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) 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 land warfare.

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.

MILITARY SCIENCE M S

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 II
Spring. 0(0-1) Approval of department or M S II 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.

121. 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.

122. 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.

MUSIC MUS

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 participates 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 credit. 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. The highest level of performance is required.
Full range of wind literature is performed. Public concerts are presented both on and off campus.

133. Orchestra
Fall, Winter, Spring. 1(0-5) May reenroll for a maximum of 12 credits. Membership determined by audition.
Standard overtures and symphonies studied and publicly performed. Attendance at all rehearsals and public concerts obligatory.

135. Music in Elementary Education
Fall, Winter, Spring, Summer. 4(3-3)
Elementary education majors.
Basis, scope and sequence of music instruction in the elementary schools 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 comet.

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.