

# College of Arts & Sciences

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# Aerospace Studies

## Air Force ROTC

Air Force Reserve Officer Training Corps (ROTC) is administered by the Department of Aerospace Studies and is a program in the College of Arts and Sciences. The mission of Air Force ROTC is to produce leaders for the Air Force and build better citizens for America. As the largest source of Air Force officers, Air Force ROTC offers a number of opportunities for UMR students who wish to become commissioned officers by offering professional, academic, and military training. Leadership, communication, and basic military skills are the focus of the ROTC program. In addition to helping a student succeed during college, Air Force ROTC also fosters self-confidence and self-discipline.

Opportunities in the Air Force are excellent, with over 100 possible career fields available. Career field availability depends on academic discipline, medical condition, desires of the individual, and needs of the Air Force. As newly commissioned Second Lieutenants on active duty, Air Force ROTC graduates can serve worldwide, performing challenging and rewarding duties in highly technical, scientific, and operational areas. A few of these include design, research, engineering, systems development, space operations, computer science, procurement, flying, management, acquisitions, and maintenance.

Although Air Force ROTC is set up as a four-year program, students can choose a four, three, or two-year course of study. The first two years of the program, called the General Military Course (GMC), cover basic introductory military topics as well as communication and leadership. The final two years of the program, called the Professional Officer Course (POC), cover topics such as leadership, management, doctrine, international events, quality, communication, and officership. In addition to the academic ROTC class, all cadets attend up to a one and a half-hour leadership laboratory each week. Leadership laboratory provides cadets with the knowledge and practical command and staff leadership experience in preparation for active duty as Air Force officers. It is largely cadet planned, directed, and centered.

Scholarships, which may cover up to full tuition and fees, based on residency are available to qualified cadets. A monthly stipend is given during the academic year to each cadet on scholarship and also to members of the POC. Students who receive an AFROTC scholarship also receive an annual \$2000 supplement from UMR, which will currently cover most room costs excluding board. Lastly, scholarship recipients receive a \$600/year book allowance to offset costs. ROTC scholarship recipients are eligible to receive other UMR scholarships. Students do not have to be on a scholarship to complete our program and be an Air Force officer.

There is no obligation connected in taking Air Force ROTC for a non-scholarship cadet during the freshman and sophomore years. Obligations begin only at the start of a student's last two years of the program or after a ROTC scholarship is awarded and activated.

Students usually attend summer field training prior to their junior year, before enrollment into the POC. Entrance into the POC is based on an extensive evaluation and selection process during the student's sophomore year. Cadets who complete the POC in good standing and earn their academic degree are commissioned as second lieutenants and serve on active duty for four or more years, depending on their selected Air Force career field. Pilots incur a ten-year active duty service commitment after completing undergraduate pilot training. Navigators incur a eight-year active duty service commitment after completing undergraduate navigator training.

The Air Force ROTC unit at UMR is organized as an objective wing, with associate groups, squadrons, and flights. Freshmen and sophomore cadets are assigned to one of the flights. They receive instruction from POC cadets in basic military customs and courtesies, drill movements, and many other facets of Air Force operations. Additionally, they are offered the opportunity to visit Air Force bases and discuss career opportunities with Air Force members. Junior and senior cadets are assigned and rotated through various leadership positions, gaining experience in management procedures.

## Faculty

### Professor:

Jonathan Hines, (Department Chair), M.S., University of N. Dakota and B.S., Southeast Missouri State

### Assistant Professors:

Angela L. McLane, B.S., Oklahoma State

Stephen T. Sullivan, M.S., Central Missouri State

Stanley J. Woronick, M.A., Webster University

## Aerospace Studies Courses

- 150 Foundations Of The U.S. Air Force I** (LEC 0.5 and LAB 0.5) This survey course is designed to introduce students to the USAF and AFROTC. Topics include: military customs and courtesies, uniform wear, officership qualities, professionalism, AF core values, equal opportunity and treatment, AF officer benefits and opportunities and an introduction to communication skills. Leadership Lab is mandatory for cadets planning on a career in the AF.
- 151 Foundations Of The U.S. Air Force II** (LEC 0.5 and LAB 0.5) This survey course is a continuation of Arosp S 150. Covered topics include: origin of the AF, mission and organization of the AF, organization of a standard AF base, and further communication skills development. Leadership Lab is also mandatory for cadets.
- 200 Leadership Laboratory** (LEC 0.5 and LAB 0.5) The course involves a study of Air Force customs and courtesies, drill and ceremonies, career opportunities in the Air Force and the life and work of an Air Force junior officer. Students develop their leadership potential in a practical supervised training laboratory, which typically includes field trips to Air Force installations throughout the United States.
- 250 The Evolution Of USAF Air And Space Power I** (LEC 0.5 and LAB 0.5) This course is designed to

examine the general aspects of air and space power through a historical perspective. covering a time period from the first balloons to the beginning of the space age. It provides students with a knowledge level understanding of the general elements and employment of air and space power from an institutional doctrinal and historical perspective. Examples of the importance of AF core values in historical events and in past AF leaders are pointed out. Continued development of communication skills is also emphasized. Leadership Lab is mandatory for cadets planning on a career in the AF.

- 251 The Evolution Of USAF Air And Space Power II** (LEC 0.5 and LAB 0.5) This course is a continuation of Arosp S 250. It covers a time period in AF history from the beginning of our space age in the early 1960's to the present...with a continued emphasis on recognizing how past leaders and events have shaped our current AF organization and doctrine. Communication skills exercises are continued. Leadership Lab is also mandatory for cadets.
- 350 Air Force Leadership Studies I** (LEC 2.5 and LAB 0.5) This course introduces students to the leadership and management skills required of an Air Force junior officer. Special topics include leadership ethics, the Air Force personnel and evaluation systems, and management fundamentals. Through the use of classroom tools that include case studies, Air Force leadership and management situations are examined and practical applications of studies concepts are exercised. The principles and theories of ethical behavior as well as the complete understanding of the individual responsibility and authority of an Air Force officer are stressed. This course includes a Leadership Lab that provides the students the opportunity to apply leadership and management principles.
- 351 Air Force Leadership Studies II** (LEC 2.5 and LAB 0.5) This course is a continuation of Arosp S 350. Emphasis is placed on professional knowledge, communication skills, and ethical behavior. Varied Air Force-peculiar formats and situations are offered to apply learned listening, writing, and speaking skills. This course includes a Leadership Lab that provides the students the opportunity to apply leadership and management principles.
- 380 National Security Affairs/Preparation For Active Duty I** (LEC 2.5 and LAB 0.5) This course examines national security policies, processes, and issues along with Air Force strategy and doctrine. Special topics include Air Force roles and missions, the roles of various federal government departments, military organizations and functions, and the concept of joint operations. Within this structure, continued emphasis is given to refining communication skills. This course includes a Leadership Laboratory that provides advanced leadership experiences, giving students the opportunity to apply the leadership and management principles of this course.

- 381 National Security Affairs/Preparation For Active Duty II** (LEC 2.5 and LAB 0.5) Continuation of Arosp S 380. This final course of the Air Force ROTC curriculum examines officership, advanced leadership ethics, military law, current Air Force issues, regional studies, core values, and preparation for active duty. This course includes a Leadership Laboratory that provides leadership experiences, giving students the opportunity to apply the leadership and management principles of this course.

## Art

The study of art can broaden your experiences and help you gain a better perspective on the world.

UMR offers courses in art appreciation, art history, study of film, and applied courses in design, painting, and photography. Non-credit courses are available from time to time in other applied art or special interest courses.

### Faculty

**Professor:**

James Bogan, Ph.D., Kansas

**Lecturer:**

Leo Soisson, M.F.A., Southern Illinois

**Instructor:**

Luce Myers, B.S., Bradley University

### Art Minor

The Art Minor offers students the opportunity to pursue an area of focus in studio art, art history, and film studies.

**Requirements:** The minor requires 15 hours, including Art 80: Art Appreciation, which is a required course. Students may take additional hours from these offerings: Art 85: Study of film; Art 222: Revolution and Romanticism; Art 255: Script to Screen; Philosophy 330: Aesthetics, and topics course from the Art 101, 201, 301 series. In addition, students may take up to six hours of Studio classes.

### Film and Literature Minor

The Film and Literature Minor is an interdisciplinary and inter-textual course of study in which students will explore the connections between different mediums, increasing the pleasure and understanding of each.

**Requirements:**

The minor requires 12 hours, including the following required courses: Art 85: Study of Film (3 hours) and the core course English 177: Literature and Film (3 hours).

In addition, students will take 6 hours of electives in the field of literature and film studies. These electives can include but are not limited to:

- Art 255: Script to Screen (3)
- English 278: Thematic Studies in Lit & Film (3)
- English 279: Genre Studies in Lit & Film (3)
- Art 250: Thematic Studies in Film & Lit (3)
- Art 251: Genre Studies in Film & Lit (3)

## Art Courses

- 20 Drawing I** (LEC 3.0) Principles of drawing: placement, proportion, perspective, chiaroscuro, values, line, form, texture, and techniques. Applied problems to develop perceptual observation.
- 30 Drawing II** (LEC 3.0) Application of drawing principles: cast and life drawing. Exercises in representational rendering. Prerequisite: Art 20.
- 40 Painting I** (LEC 3.0) Basic Exploration of oil painting techniques and methods. Still life, landscape and figure.
- 50 Painting II** (LEC 3.0) Continuation of Art 40. Prerequisite: Art 40.
- 80 Art Appreciation** (LEC 3.0) A basic introductory course designed to familiarize students who have little or no knowledge of the arts with fundamental knowledge necessary for intelligent approach to experiencing the visual arts; painting, sculpture, and architecture.
- 85 Study Of Film** (LEC 2.0 and LAB 1.0) A study of classic and contemporary films with emphasis on director's technique and philosophy. Films by Fellini, Antonioni plus Bergman, Chaplin, etc. will be viewed and discussed.
- 100 Special Problems** (IND 0.0-6.0) Problems or readings on specific subjects or projects in the department. Consent of instructor required.
- 101 Special Topics** (Variable 0.0-6.0) This course is designed to give the department an opportunity to test a new course. Variable title.
- 200 Special Problems** (IND 0.0-6.0) Problems or readings on specific subjects or projects in the department. Consent of instructor required.
- 201 Special Topics** (Variable 0.0-6.0) This course is designed to give the department an opportunity to test a new course. Variable title.
- 203 Architectural Design I** (LEC 1.0 and LAB 2.0) Introduction to the interaction between architecture and art. A series focused on the history of architecture as it relates to styles and functions. Theories of building and site design, plan and spatial organization, formal composition, and environmental context are considered as principle form determinants. Prerequisite: Sophomore standing.
- 219 Art For Elementary Teachers** (LEC 3.0) Considers the vital role of art activities and creative experiences in the growth and development of children at their level. Prerequisite: Educ 40. (Co-listed with Educ 219)
- 222 Revolution And Romanticism In The Arts 1785 - 1832** (LEC 3.0) This course will investigate the great revolution of thought, perception, language, through art during the period between 1785 and 1832. Artists, writers, and musicians to be studied include: Blake, David, Wordsworth, and Beethoven. The role of art and artists to the French Revolution will be stressed. Prerequisite: Introductory level Art or History course.
- 245 Thomas Hart Benton And The Tradition Of American Art** (LEC 3.0) Missouri artist Tom Benton lived amidst controversy and acclaim from the 1920's to the 1970's. The American tradition from which Benton grew will be studied, then his own work and his subsequent influence.

Prerequisite: Art 85 or Art 80.

- 250 Thematic Studies In Film & Literature** (LEC 3.0) Different thematic relationships between film & literature (e.g., Poe & Hitchcock, Shakespeare on Film, etc.) will be studied. Prerequisite: Art 85.
- 251 Genre Studies In Film & Literature** (LEC 3.0) Topics examine various generic relationships between film & literature. (e.g., comedy, film noir, western film/literature) Prerequisite: Art 85.
- 255 Script To Screen: How Books Become Films** (LEC 3.0) This course will focus on how words are transmuted into film images. By comparing the tests of poems, stories, and novels with the finished film, a double appreciation of both film and literature is gained. Prerequisite: Introductory level Art or Literature course.
- 300 Special Problems** (IND 0.0-6.0) Problems or readings on specific subjects or projects in the department. Consent of instructor required.
- 301 Special Topics** (Variable 0.0-6.0) This course is designed to give the department an opportunity to test a new course. Variable title.

## Arts and Sciences

### Bioinformatics Minor Curriculum

Bioinformatics is the rapidly-developing field that applies computational methods to address biological questions, and includes new advances in computer science, mathematics, and biology. Students entering the field of bioinformatics should have some training in each of these fields.

The minor is designed for students pursuing a BS who would have the necessary prerequisites for the required courses. Students pursuing a BA may participate if the prerequisites for the required courses are fulfilled. Each department (Biological Sciences, Computer Science, Mathematics) will designate a minor advisor. The student's minor advisor will be chosen from outside of their major area of study.

Required courses:

- BIO 110 General Biology (3 hrs)
- BIO 211 Cellular Biology (4 hrs) or BIO 231 General Genetics (3 hrs)
- BIO 331 Molecular Genetics (3 hrs)
- CMP SC 53, 54 Introductory Programming, Introductory Programming Lab (4 hrs)
- CMP SC 153 Data Structures I (3 hrs)
- CMP SC 238 File Structure and Introduction to Database Systems (3 hrs)
- BIO 301/CMP SC 301 Bioinformatics (3 hrs) (It is strongly recommended that this course be taken after the other BIO and CMP SC requirements)
- STAT 301 Biostatistics (4 hrs) or STAT 346 Regression Analysis (3 hrs) or STAT 353 Statistical Data Analysis (3 hrs)

One additional course, 200 or above in MATH, or 300 or above in BIO or CMP SC, outside of the major area of study, and as agreed upon by the minor advisor (3+ hrs)

## Arts and Sciences Courses

- 101 Special Topics** (Variable 0.0-6.0) This course is designed to give the department an opportunity to test a new course. Variable title.
- 110 Hit The Ground Running** (LEC 3.0) An introductory, multi-faceted lecture including a coordinated presentation of mathematics principles, chemical principles, academic skills development, and the elements of academic leadership. Objectives are to provide students with a positive and realistic experience that supports establishment of valid academic expectations and provides knowledge of the resources and strategies necessary to begin a strong academic career.
- 111 Women as Global Leaders** (LEC 0.5) The class will encourage the development of the skills necessary for strong leadership. It will begin with skills assessment, progress through seminars and workshops led by women alumni, and culminate in the project and team-building exercises. Course may be repeated for credit.

# Biological Sciences

## Bachelor of Arts

## Bachelor of Sciences

Biological sciences or biology is the study of life and living organisms. Biological Sciences embraces a vast and rapidly expanding body of knowledge and inquiry. Including

- biochemistry, sub-cellular and molecular biology,
- the anatomy and physiology of cells, tissues, organs and organ systems, whole multi-cellular plants, animals, and fungi,
- the complex structure, function, behavior, and interactions of individuals, populations, communities, ecosystems, and the entire biosphere.

Biology also draws on the physical sciences (chemistry, physics, mathematics, and earth sciences) as well as the behavioral sciences for analysis and interpretation of life processes and interrelationships.

The study of biology provides an academic foundation for career and postgraduate opportunities in:

- Industry and government (chemical, food, agriculture, pharmaceutical, environmental, research)
- Education (teaching and graduate study)
- Health professions (human medicine, dentistry, pharmacy, veterinary medicine, physical therapy, etc.)

The core curriculum required of all biological sciences majors consists of basic course work in introductory biology, zoology, plant biology, cellular biology, microbiology, genetics, and ecology. A variety of advanced courses offer greater depth, detail and specific information leading to proficiency and preparation for employment and other postgraduate activities.

At UMR faculty members active in research teach all biological sciences courses. Classes are small, providing

exceptional opportunity for discussion and individual attention. Most undergraduate students participate in research, learning techniques and developing skills that will prepare them for many exciting postgraduate opportunities. A background in mathematics and physical sciences, together with outstanding supporting course work in the humanities and social sciences provide a well-rounded educational experience and enhanced understanding. UMR students who have received their B.S. degrees in biological sciences have an excellent record of success. Average performance on nationally normed achievement examinations has been very high. Acceptance of UMR students in professional schools of medicine, dentistry and pharmacy, and subsequent performance of our students in these professional schools, remains exceptionally high. Many UMR biological sciences graduates have been accepted into prestigious graduate study programs in a variety of areas, including biochemistry, microbiology, immunology, molecular genetics and genetic engineering, marine biology, cell and mammalian physiology, human physiology, environmental science, plant physiology, and evolution. Employment opportunities are varied, and future prospects for graduates in the biological sciences remain promising. The broad educational resources and depth of understanding available to the UMR student of biology offer preparation and a competitive edge for a broad variety of jobs and graduate study programs.

## Faculty

### Professor:

- Robert S. Aronstam, (Chair), Ph.D., University of Rochester
- Roger Brown, Ph.D., Colorado State
- Nord Gale (Curators' Teaching Professor Emeritus), Ph.D., Brigham Young
- Paula Lutz, (Dean, College of Arts & Sciences) Ph.D., Duke

### Associate Professor:

- Ronald L. Frank, Ph.D., Ohio State
- James Hufham (Emeritus), Ph.D., Nebraska
- Melanie Mormile, Ph.D., Oklahoma
- David Westenberg, Ph.D., UCLA

### Assistant Professor:

- Ching-Nen Nathan Chen, Ph.D., National Taiwan University, Taiwan
- Yue-Wern Huang, Ph.D., Wisconsin-Madison
- Anne Maglia, Ph.D., University of Kansas
- Dev Niyogi, Ph.D., University of Colorado
- Katie Shannon, Ph.D., Harvard Medical School

### Lecturer:

- Tonye Numbere, Ph.D., Kansas State
- Terry Wilson, M.S., Southwest Missouri State

## Bachelor of Arts

## Biological Sciences

## Degree Requirements

Specific requirements for the B.A. degree in biological sciences include a minimum of 120 semester hours of credit.

Core Courses	Credit
Bio Sc 102-Intro to Bio Sc . . . . .	.1

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Bio Sc 110-Gen Bio or Bio Sc 111-Princ Bio	.3
Bio Sc 112-Gen Bio Lab	.2
Bio Sc 115 & 116-Zoology or Bio Sc 118 & 119-Plant Bio	.4
Bio Sc 211-Cell Biology	.4
Bio Sc 231-Gen Genetics	.3
Bio Sc 251-Ecology	.3
Bio Sc 310-Seminar	.1
Advanced courses, 200 level or higher (at least one with laboratory and one 300 level)	.9
Chemistry	
Chem 1,2,3, & 4-General Chem	.9
Chem 221 & 223-Org Chem	.6
Mathematics & Physical Science	
Various courses in mathematics, physics, and/or geology chosen in consultation with academic adviser.	
(Note: Proficiency in College Algebra must be demonstrated by a grade of "C" or better in a College Algebra course or by examination.	
	.9
Computer Science/Statistics (One of the following)	
Cmp Sc 053-Intro to Prog	.3
Stat 115-Stat for Soc Sci	.3
Stat 211-Stat Tools for Decision Making	.3
CAS General Requirements for BA (Basic skills/concepts)	
English Composition	.6
Western Civilizations	.6
Foreign Language	.11
General Education	
Humanities	.12
Social Sciences	.12
Electives	.16
	Total 120 hours

### Bachelor of Arts Biological Sciences Pre-Medicine Emphasis Area Degree Requirements

#### FRESHMAN YEAR

First Semester	Credit
Bio Sc 102-Intro to Bio Sc	.1
Bio Sc 110-Gen Bio or Bio Sc 111-Princ Bio	.3
Bio Sc 112-Gen Bio Lab	.2
Mathematics	.5
English 20 or Hum Electives	.3
Chem 4-Intro to Lab Safety	.1
	15
Second Semester	
Bio Sc 231-Gen Genetics	.3
Chem 1-Gen Chem	.4
Chem 2-Gen Chem Lab	.1
History 111-Western Civ	.3
English 20 or Humanities Electives	.3
	14

#### SOPHOMORE YEAR

First Semester	Credit
Bio Sc 211-Cellular Bio	.4
Chem 3-Gen Chem	.3
Physics I	.4
Language I	.4
	15
Second Semester	
Bio Sc 251-Ecology	.3
Physics II	.4
Language II	.4
History 112-Western Civ II	.3
English 60-Writing & Research	.3
	17

#### JUNIOR YEAR

First Semester	Credit
Social Science Elective	.3
Chem 221-Organic Chem I	.3
Chem 226-Organic I Lab	.1
Language III	.3
Stat/Cmp Sc	.3
	13
Second Semester	
Bio Sc 242-Human Physiology	.5
Chem 223-Organic Chem II	.3
Chem 228-Organic Chem II Lab	.1
Humanities Elective	.3
Bio Sc 115 & 116 Zoology	.4
	16
	Take MCAT

#### SENIOR YEAR

First Semester	Credit
Advanced Bio or Biochem	.4
Bio Sc 310-Senior Seminar	.1
Humanities Elective	.3
Social Science Elective	.3
Free Electives	.3
	14
Retake MCAT (if desired) Apply to Medical School (for admission next Fall)	

Second Semester	
Humanities Elective	.3
Social Sciences Electives	.6
Free Electives	.7
	16
	Total Hours 120

### Bachelor of Arts Biological Sciences Teacher Certification Degree Requirements

The student will fulfill the requirements for:

- 1) the Bachelor of Arts in Biological Sciences (except for eign language) and
- 2) the requirements for Missouri certification in teaching Biology (See Education) Contact the UMR Biological Sciences Department for advising.

## Bachelor of Science Biological Sciences Degree Requirements

Specific requirements for the B.S. degree in biological sciences include a minimum of 130 semester hours of credit, which must include 46 semester hours of biological sciences course work, to include:

	Credit
Bio Sc 102-Intro to Bio Sc . . . . .	1
Bio 110-Gen Bio or Bio Sc 111-Princ Bio . . . . .	3
Bio Sc 112-Gen Bio Lab . . . . .	2
Bio Sc 115-Zoology . . . . .	3
Bio Sc 116-Zoology Lab . . . . .	1
Bio Sc 118-Plant Biology . . . . .	3
Bio Sc 119-Plant Biology Lab . . . . .	1
Bio Sc 211-Cellular Biology . . . . .	4
Bio Sc 221-Microbiology . . . . .	3
Bio Sc 222-Microbiology Lab . . . . .	2
Bio Sc 231-General Genetics . . . . .	3
Bio Sc 251-Ecology . . . . .	3
Bio Sc 310-Seminar . . . . .	1

Advanced biological sciences or approved advanced course work in other science or eng disciplines . . . . .16  
 21 semester hours of chemistry to include general chemistry (Chem 1,2,3, & 4) . . . . .9  
 Chem 361 & 362-General Biochemistry . . . . .5  
 Chem 221, 226, 223, 228-Org Chem . . . . .8  
 Physics 21,22,25 & 26-two semesters of physics . . .10

The Math/Statistics requirement will be a minimum of 10 credit hours with a requirement for Math 8, Math 21 or an approved statistical course may be used to meet 10 hr Math requirement for students entering at 6 or 8.

12 semester hours of humanities, excluding foreign language, and to include: English 20 (entering students will normally take English 20 either semester of the first year) and English 60.....12

9 semesters hours of social sciences, (to include Hist 112 or 175 or 176 or Pol Sc 90, or equivalent.....9

**Elective credits:** In consultation with his or her advisor, each student will elect sufficient additional courses to complete a minimum of 130 credit hours.

A minimum grade of "C" is required for each Biological Science course used to fulfill the B.S. degree requirements.

### Minor Curriculum

A student wishing to minor in biological sciences must take a minimum of 20 hours of biological sciences course work which should include Bio Sc 110, 112, 115, or (211) and at least seven hours of advanced Bio Sc to be selected upon consultation with a Bio Sc department advisor. Students minoring in biological sciences should declare these intentions prior to the junior year.

### Bioinformatics Minor

Students majoring in biological sciences are eligible to pursue a minor in bioinformatics. See the description of the bioinformatics minor under the heading Arts and Sciences.

### Biological Sciences Courses

- 101 Special Topics** (Variable 0.0-6.0) This course is designed to give the department an opportunity to test a new course. Variable title.
- 102 Introduction To Biological Science** (LEC 1.0) An introduction to the study of biology at UMR. Students will consider personal and professional opportunities within the various areas of biology and become acquainted with Biological Sciences faculty and departmental and campus facilities. Required of freshman Biological Sciences majors.
- 110 General Biology** (LEC 3.0) A comprehensive study of the general principles of the biology of plants, animals, and protists including population biology and regulation mechanisms. Prerequisite: Entrance requirements.
- 111 Principles of Biology** (LEC 3.0) A comprehensive study of the general principles of the biology of plants, animals, and protists including population biology and regulation mechanisms. An in-depth study of the fundamental principles governing all living organisms from the molecular to the population level. Required for Biological Sciences majors. Cannot also receive credit for Bio 110. Prerequisite: Entrance requirements.
- 112 General Biology Lab** (LEC 1.0 and LAB 1.0) The laboratory work accompanying general biology consists of experiments designed to supplement and extend lectures in course Bio 1. Prerequisite: Preceded or accompanied by Bio 110.
- 115 Zoology** (LEC 3.0) Survey class that explores the diversity of animal life. Emphasis on the morphology, physiology, development, ecology, and phylogeny of animals and protozoans.
- 116 Zoology Laboratory** (LAB 1.0) Bio Sci 116 is designed to accompany Bio Sci 115 and consists of laboratory and field explorations of the diversity of animal life. Prerequisite: Preceded or accompanied by Bio Sci 115.
- 118 Plant Biology** (LEC 3.0) A survey course covering the cellular structures unique to plants, their bizarre life cycles, and the mechanisms they use to survive, reproduce, and convert solar energy into a form usable by all other organisms. Prerequisite: Bio Sci 110 or Bio Sci 111.
- 119 Plant Biology Laboratory** (LAB 1.0) Bio 119 is designed to accompany Bio 118 and consists of experiments that will supplement and extend the lectures in Bio 118. Among the topics to be covered are photosynthesis, diversity, respiration, anatomy and development, hormones, and transpiration. Prerequisites: Bio 112, preceded or accompanied by Bio 118.
- 121 Microbes And Man -- Introductory Microbiology** (LEC 3.0) An introduction to the study of microorganisms in nature, especially as they affect

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- humans. Consideration of the involvement of microorganisms in disease, decomposition, nutrition, agriculture, food processing and preservation, industrial applications and waste treatment.
- 201 Special Topics** (Variable 0.0-6.0) This course is designed to give the department an opportunity to test a new course. Variable title.
- 211 Cellular Biology** (LEC 3.0 and LAB 1.0) Study of the structure and function of eukaryotic and prokaryotic cells. Emphasis on macromolecules, metabolic pathways, and subcellular organelles. Prerequisite: Preceded or accompanied by Chem 3.
- 221 Microbiology** (LEC 3.0) General introduction to the culture and study of microorganisms, their physiology, structure, and contribution to biology. Prerequisite: Bio 211.
- 222 Microbiology Lab** (LAB 2.0) General introduction to the techniques used for the culture and identification of microorganisms, their physiology, structure, and contribution to biology. Prerequisite: Preceded or accompanied by Bio Sci 221.
- 231 General Genetics** (LEC 3.0) The study of the principles of heredity and reasons for variation in plants and animals. A study of Mendelian principles and population genetics with emphasis on the human.
- 235 Evolution** (LEC 3.0) A survey of the genetic and environmental mechanisms associated with organic evolution.
- 241 Human Anatomy** (LEC 3.0 and LAB 2.0) Study of gross anatomy and microscopic anatomy of the human organ systems. Laboratory work includes dissection of the cat. Prerequisite: Bio Sci 110 or Bio Sci 111.
- 242 Human Physiology** (LEC 3.0) Study of the function of the organ systems of the human body with emphasis on organ systems interactions. Prerequisites: Bio Sci 110, Bio Sci 111, or Bio Sci 211.
- 243 Human Physiology Laboratory** (LAB 1.0) Laboratory activities and demonstrations of basic physiology of human organ systems. Prerequisite: Accompanied or preceded by Bio Sci 242.
- 251 Ecology** (LEC 3.0) Relationships between organisms and the environment. Topics include the influence of environmental factors on individual organisms, population dynamics, interspecific associations, and entire ecosystems. Prerequisite: Bio Sci 110 or Bio Sci 111.
- 300 Special Problems** (IND 0.0-6.0) Problems or readings on specific subjects or projects in the department. Consent of instructor required.
- 301 Special Topics** (Variable 0.0-6.0) This course is designed to give the department an opportunity to test a new course. Variable title.
- 310 Seminar** (RSD 0.0-6.0) Presentation of a scientific paper concerned with current topics in biological sciences. Prerequisite: Senior standing.
- 311 Bioinformatics** (LEC 3.0) The course will familiarize students with the application of computational methods to biology, as viewed from both perspectives. It will introduce problems in molecular, structural, morphological, and biodiversity informatics, and will discuss principles, algorithms, and software to address them. Prerequisite: Junior standing or above. (Co-listed with Comp Sci 311)
- 315 Developmental Biology** (LEC 3.0) Study of the patterns of development of the vertebrate embryo, the molecular mechanisms of tissue induction, and interactions among developing tissues. Prerequisites: Bio 115 and Bio 211.
- 321 Pathogenic Microbiology** (LEC 3.0) A study of medically important microorganisms. Students will learn about the properties that enable organisms to cause disease as well as the disease process within the host. Special emphasis will be placed on recent advances in the molecular genetics of host pathogen interaction. Prerequisite: Bio 221 or Cv Eng 261.
- 322 Pathogenic Microbiology Laboratory** (LAB 2.0) An investigation of techniques for the isolation and identification of pathogenic microorganisms. Prerequisite: Preceded or accompanied by Bio 321.
- 325 Microbiology In Bioengineering** (LEC 3.0) General introduction to prokaryotic and eukaryotic microorganisms and viruses. Consideration of various parameters affecting the growth, basic techniques of culture, and industrial applications of microorganisms. Prerequisite: Bio 211.
- 327 Plant Physiology** (LEC 3.0) This course will cover structures and functions of plants from the cellular to the whole plant levels. Topics covered include absorption and transport of water and mineral nutrients, photosynthesis, metabolism of starch and lipids, secondary metabolism, plant stress physiology, and plant hormones. Prerequisites: Bio Sci 111, 110; Bio Sci 118, 119.
- 328 Nutritional And Medicinal Properties Of Plants** (LEC 3.0) A survey of the biochemical and physiological functions of mineral elements, vitamins, and other organic compounds from plants necessary in human nutrition; and an overview of the medicinal derivatives of various plants, their effects and uses. Prerequisites: Bio Sci 110 or Bio Sci 111; and Bio Sci 211.
- 331 Molecular Genetics** (LEC 3.0) A study of the properties and functions of DNA that make this macromolecule unique in the universe. Examples of replication, transcription, translation, repair, and regulation will be examined in viruses, prokaryotes, and eukaryotes. Prerequisites: Bio 231 and Bio 211.
- 332 Molecular Genetics Laboratory** (LAB 2.0) This course provides experience in the use of a variety of DNA manipulation techniques that are common to molecular studies. These include DNA extraction, restriction mapping, Southern blotting, recombinant plasmid construction, DNA sequencing and analysis, and polymerase chain reaction. Prerequisite: Preceded or accompanied by Bio 331.
- 340 Biomaterials I** (LEC 3.0) This course will introduce senior undergraduate students to a broad



array of topics in biomaterials, including ceramic, metallic, and polymeric biomaterials for in vivo use, basic concepts related to cells and tissues, host reactions to biomaterials, biomaterials-tissue compatibility, and degradation of biomaterials. Prerequisite: Senior undergraduate standing. (Co-listed with Cer Eng 340, Met Eng 340, Chem Eng 340)

- 342 Exercise Physiology** (LEC 3.0) Covers cardiovascular, pulmonary, and metabolic responses to aerobic and anaerobic muscular activities, work capacities, nutritional factors in performance, and role of exercise in health. Prerequisite: Bio Sci 110 or Bio Sci 111.
- 345 Comparative Chordate Anatomy** (LEC 2.0 and LAB 2.0) An integrated, comparative study of chordate structures and systems, with emphasis on evolution, development and function. Includes examination of gross anatomy and histology of selected forms. Prerequisites: Bio Sci 110 or 111, and Bio Sci 115 and 116.
- 352 Biological Effects Of Radiation** (LEC 3.0) Introduction to biological effects of ionizing radiation including mode of induction of mutations, effects on the developing fetus and specific tissues plus therapeutic applications of various types of radiation. Prerequisites: Bio Sci 110 or Bio Sci 111; and Chem 3.
- 354 Freshwater Ecology** (LEC 3.0) The ecology of streams, lakes, and wetlands. The course will cover the physical and chemical characteristics of freshwater environments, the diversity of life in freshwaters, biogeochemical processes, and threats to freshwater systems. Prerequisite: Bio Sci 251.
- 361 Cell Physiology** (LEC 3.0) Consideration of the physiochemical nature of the cell, its relationship with environment, and its metabolic pathways. Prerequisite: Bio 211.
- 365 Comparative Animal Physiology** (LEC 3.0) A comparative study of functional relationships, physiological adaptations, and survival strategies which are observed among various groups of animals as they respond to natural environmental conditions. Emphasis is placed on relating biochemical function and phylogenetic relationships. Prerequisites: Bio 215, Chem 223, and Bio 211 or Chem 361.
- 370 Toxicology** (LEC 3.0) A study of natural and man-made toxicants, various possible routes of exposure, absorption, distribution, biotransformation, specific target sites, and mechanisms involved in elicitation of toxic effects, as well as detoxification and excretion. Prerequisites: Bio 211 plus either Bio 215 or 242.
- 375 Advanced Biology Lab Techniques I** (IND 1.0-3.0) Advanced level laboratory designed to acquaint students of cellular and molecular biology with techniques employed in current research. Students select one to three miniprojects, each designed to involve 40 to 45 hours of library and laboratory work. Prerequisite: Junior or senior

standing in Biological Sciences or related field plus consent of instructor.

- 376 Advanced Biology Lab Techniques II** (IND 1.0-3.0) Continued laboratory study of current bioresearch techniques. Further work with miniprojects. Prerequisite: Junior or senior standing in Biological Sciences or related field plus consent of instructor.
- 381 Immunology** (LEC 3.0) A study of the principles of immunology, including biological and biochemical aspects of the immune response, immunochemistry, serology, immunoglobulin and T-cell mediated allergies, tumor and transplantation immunology, autoimmune diseases, and the role of immunity in host defense. Prerequisites: Chem 223 or Chem 363 and Bio 211.
- 390 Undergraduate Research** (IND 1.0-3.0) Designed for the undergraduate student who wishes to engage in research. Not for graduate credit. Not more than six credit hours for graduation credit. Subject and credit to be arranged with the instructor. Prerequisite: Consent of instructor.
- 391 General Virology** (LEC 3.0) An overview of the field of virology, including plant, animal, and bacterial viruses. Discussions will include morphology, classification, virus-host interactions, genetics, clinical and industrial aspects of viruses, and viruses as model systems for basic biological studies. Prerequisites: Bio Sci 110 or 111; Bio Sci 211, 221, Chem 1, 3, 221.

## Chemistry

Bachelor of Arts

Bachelor of Science

Bachelor of Science(non-ACS  
Certified)

Master of Science

Master of Science for Teachers

Doctor of Philosophy

**Emphasis areas at Bachelor of Science level in biochemistry, polymer and coatings science, and pre-medicine chemistry.**

Chemistry is the study of the elements, the compounds they form and the reactions they undergo.

The program of study encompasses the full range of the subject plus mathematics, physics, and, if desired, biology. Students may also pursue special interests such as analytical, biological, electrochemical, environmental, inorganic, nuclear, organic, physical or polymer chemistry.

The B.A. offers a general education degree with a chemistry focus. The B.A. degree may be appropriate for students in pre-professional programs (pre-medicine, pre-veterinary, pre-dentistry, pre-pharmacy, chemical sales and marketing).

Chemists tackle a broad range of challenges, from environmental cleanup and pollution prevention to cre-

ating the materials that will take humans to Mars. A Bachelor's degree in Chemistry will provide many career possibilities. It has been called the central science because it occupies a pivotal place in many disciplines. As such it serves as the foundation for many other professions such as medicine, biotechnology, ceramics, chemical engineering, polymers, materials, metallurgy and environmental sciences.

All students are encouraged to participate in research programs during their undergraduate career. Such participation can lead to valuable experience and the possibility of publications, awards and recognition in the chemistry work place. Students may opt to participate in the campus wide "Opportunities in Research Experience" (OURE). Through OURE they can receive academic credit and a stipend for conducting a research project of mutual interest to the student and a faculty member.

Schrenk Hall is home to the department and where most chemistry classes and laboratories are held. The department has a broad range of modern instrumentation and equipment to prepare the student for the future.

## Faculty

### Professors:

Philip Whitefield (Department Chair), Ph.D., University of London

Queen-Mary College, London, England

Frank Blum (Curators'), Ph.D., Minnesota

Harvest Collier (Vice Provost, Office of Graduate and Undergraduate Studies), Ph.D., Mississippi State

Nuran Ercal, Ph.D., Hacettepe University

Shubhender Kapila, Ph.D., Dalhousie University

Gary Long, Ph.D., Syracuse

Yinfa Ma, Ph.D., Iowa State University

Ekkehard Sinn, Ph.D., University of New South Wales

Chariklia Sotiriou-Leventis, Ph.D., Michigan State University

Jay A. Switzer (Donald L. Castleman/FCR Missouri Endowed Professor of Discovery in Chemistry), Ph.D., Wayne State University

### Associate Professors:

Nicholas Leventis, Ph.D., Michigan State University

Thomas Schuman, Ph.D., University of Alabama in Huntsville

Pericles Stavropoulos, Ph.D., Imperial College of Science, Tech. & Medicine, London, U.K.

Michael R. Van De Mark, Ph.D., Texas A&M

Klaus Woelk, Ph.D., University of Bonn, Germany

### Assistant Professors:

Charles C. Chusuei, Ph.D., George Mason University

Paul K.S., Nam, Ph.D., University of Missouri-Columbia

V. Prakash Reddy, Ph.D., Case Western Reserve University

Jeffrey Winiarz, Ph.D., State University of New York at Buffalo

### Lecturers:

Terry Bone, Ph.D., University of Missouri-Rolla

David Hoiness, Ph.D., Baylor University

### Adjunct Professors:

Tadashi Tokuhiro, Ph.D., Tokyo Institute of Technology

### Emeritus Faculty

Donald Beistel, Ph.D., Delaware

Gary Bertrand, Ph.D., Tulane

Louis Biolsi, Ph.D., Rensselaer

Samir Hanna, Ph.D., MIT

Fred Hardtke, Ph.D., Oregon State

William James, Ph.D., Iowa State

Oliver Manuel, Ph.D., Arkansas

Hector McDonald, Ph.D., Arkansas

B. Ken Robertson, Ph.D., Texas A&M

D. Vincent Roach, Ph.D., University of Missouri-Columbia

Robert Russell, Ph.D., Kansas

Donald Siehr, Ph.D., Wisconsin

James Stoffer (Curators'), Ph.D., Purdue

Wilbur Tappmeyer, Ph.D., University of Missouri-Columbia

Raymond Venable, Ph.D., Louisiana State

David Wulfman, Ph.D., Stanford

## Bachelor of Arts Chemistry

### FRESHMAN YEAR

First Semester	Credit
Chem 1-General Chemistry . . . . .	4
Chem 2-General Chemistry Lab . . . . .	1
Chem 4-Intro to Lab Safety . . . . .	1
Math 8-Calculus with Analytic Geometry I . . . . .	5
English 20-Exposition & Argumentation . . . . .	3
	14

Second Semester	Credit
Chem 3-General Chemistry . . . . .	3
Chem 8-Qualitative Analysis . . . . .	2
History 111-Early Western Civ . . . . .	3
Math 21-Calc w/Analytic Geometry II . . . . .	5
Humanities Electives . . . . .	3
	16

### SOPHOMORE YEAR

First Semester	Credit
Chem 221-Organic Chemistry I . . . . .	3
Chem 226-Organic Chemistry I Lab . . . . .	1
Electives . . . . .	5
History 112-Modern Western Civ . . . . .	3
Humanities Elective . . . . .	3
	15

Second Semester	Credit
Chem 223-Organic Chemistry II . . . . .	3
Chem 228-Organic Chemistry II Lab . . . . .	1
Elective . . . . .	4
English 60-Writing & Research . . . . .	3
Social Elective . . . . .	3
	14

### JUNIOR YEAR

First Semester	Credit
Chem 51-Elem Quant Chem Analy . . . . .	2
Chem 52-Elem Quant Chem Analy Lab . . . . .	2
Physics 21-General Physics I . . . . .	4
Physics 22-General Physics Lab I . . . . .	1
Stat 213-Applied Engineering Stat . . . . .	3
Elective . . . . .	3
	15

Second Semester	
Chem Electives (see list below)	.4
Physics 25-General Physics II	.4
Physics 26-General Physics Lab II	.1
Electives	<u>.6</u>
	15

**SENIOR YEAR**

First Semester	Credit
Chem 241, 243 or 343-Phy Chem	.3
Chem 242 or 244-Phy Chem Lab	.1
Humanities Elective Literature	.3
Social Electives	.6
Elective	<u>.3</u>
	16

Second Semester	
Chem 310-Seminar	.1
Humanities Elective	.3
Social Sciences Elective	.3
Electives	<u>.8</u>
	15

Elective credits include a required minor in one of the following areas: English, Economics, History, Philosophy, Psychology, Sociology, Communications, Speech, Media, Political Science, Music, Mathematics, Statistics, Foreign language, Computer Science, Biology, or Art. See Undergraduate catalog for courses required for specific minor. All chemistry majors are encouraged to do research through Chem 390. A total of 9 credits of a modern foreign language must also be taken as part of the electives above.

Chem Elective must be from one or more of the following: Chem 321, 328, 342, 346, 349, 351, 355, 361, 362, 363, 371, 375, 381, 384, 385. This program of study allows students to design, in conjunction with their chemistry advisor, a program for many disciplines including pre-law, business, pre-dentistry, pre-veterinary medicine, as well as pre-medicine. An example of such a program is shown for pre-medical studies:

Bio Sc 110-Gen Bio	.4
Bio Sc 112-Bio Lab	.1
Bio Sc 211-Cellular Bio	.4
Chem 361-Biochem	.3
Chem 362-Biochem Lab	.2

A grade of "C" or better is required for each Chemistry course counted towards the degree.

## Bachelor of Science Chemistry

**FRESHMAN YEAR**

First Semester	Credit
Chem 1-General Chemistry	.4
Chem 2-General Chemistry Lab	.1
Chem 4-Intro to Lab Safety Haz Mat	.1
Chem 11-Intro to Chemistry	.1
Math 8-Calculus with Analytic Geometry I	.5
English 20-Exposition & Argumentation	.3
History 112,175,176 or Pol Sc 90	<u>.3</u>
	18

Second Semester	
Chem 3-General Chemistry	.3
Chem 8-Qualitative Analysis	.2

Math 21-Calculus with Analytic Geometry II	.5
Electives	<u>.6</u>
	16

**SOPHOMORE YEAR**

First Semester	Credit
Chem 221-Organic Chemistry I	.3
Chem 226-Organic Chemistry I Lab	.1
Math 22-Calculus with Analytic Geometry III	.4
Physics 21-General Physics I	.4
Physics 22-General Physics Lab	.1
Elective	<u>.3</u>
	16

Second Semester	
Chem 223-Organic Chemistry II	.3
Chem 228-Organic Chemistry II Lab	.1
Physics 25-General Physics II	.4
Physics 26-General Physics II Lab	.1
Cmp Sc 53 or Cmp Sc 74 & 78-Intro to Prog	.3
Stat 213-Applied Eng Stat	.3
Elective	<u>.3</u>
	18

**JUNIOR YEAR**

First Semester	Credit
Chem 343-Intro to Quantum Chemistry	.3
English 60-Writing & Research	.3
Chem 361-Biochemistry	.3
Electives	<u>.7</u>
	16

Second Semester	
Chem 51-Quantitative Analysis	.2
Chem 52-Quantitative Analysis Lab	.2
Chem 237-Inorganic Chemistry	.3
Chem 238-Inorganic Chemistry Lab	.1
Chem 241-Physical Chemistry	.3
Chem 242-Physical Chem Lab	.1
Chem 328-Organic Synthesis & Spec. Analysis	<u>.3</u>
	15

**SENIOR YEAR**

First Semester	Credit
Chem 243-Physical Chemistry	.3
Chem 244-Physical Chem Lab	.1
Chem 251-Intermediate Quantitative Analysis	.4
Chem 310-Undergraduate Seminar or	
Chem 390-Undergraduate Research	.1
Chemistry Electives	.6
Electives	<u>.2</u>
	17

Second Semester	
Chem 310-Undergraduate Seminar or	
Chem 390-Undergraduate Research	.1
Chemistry Electives	.7
Electives	<u>.7</u>
	15

**Notes:**

**Grade Requirements:** Students must complete a minimum of 131 credit hours for a Bachelor of Science in Chemistry degree. A minimum grade of "C" is required for each chemistry course counted towards the degree.

**ROTC:** Basic ROTC may be taken in the freshman and sophomore year, but is not countable towards a degree.

## 64 — Chemistry

**Chemistry Electives:** Of these thirteen (13) hours of chemistry electives, three (3) must be chosen from 300 (or 400 with permission) level chemistry courses, and ten (10) hours must be 200 level or higher in chemistry or another technical area with permission of department chairperson.

**Electives:** There are twenty-eight (28) hours of electives. Six (6) elective hours must be completed in the social sciences. Nine (9) elective hours are required in the humanities, exclusive of foreign language. Three of the humanities hours must be literature. Three (3) of the humanities hours are to be at the 100 level or higher.

Students planning to attend graduate school are encouraged to incorporate additional higher level chemistry electives, math, and foreign language, including scientific literature course. Recommended courses include but are not limited to the following:

Biology, 200 and 300 level, especially 211  
Math 200 and 300 level, especially 204, 208 & 325  
Physics 200 and 300 level, especially 208, 221, 323 & 341  
Statistics, 200 & 300 level, especially 343, 346 & 353  
Also, Ceramic Engineering 391 and 392, or Geology 381  
A foreign language series.

Students who plan to teach high school chemistry should consult the Education section of this catalog.

### Bachelor of Science Chemistry (non-ACS certified)

#### FRESHMAN YEAR

First Semester	Credit
Chem 1-General Chemistry	.4
Chem 2-General Chemistry Lab	.1
Chem 4-Intro to Lab Safety Haz Mat	.1
Math 8-Calc w/ Analytic Geometry I	.5
Electives	.3
English 20-Exposition & Argumentation	.3
	<u>17</u>

Second Semester	Credit
Chem 3-General Chemistry	.3
Chem 8-Qualitative Analysis	.2
Math 21-Calculus with Analytic Geometry II	.5
History 112,175,176, or Pol Sc 90	.3
Electives	.3
	<u>16</u>

#### SOPHOMORE YEAR

First Semester	Credit
Chem 221-Organic Chemistry I	.3
Chem 226-Organic Chemistry I Lab	.1
Math 22-Calculus with Analytic Geometry III	.4
Electives	.5
Social Sciences Elective	.3
	<u>16</u>

Second Semester	Credit
Chem 223-Organic Chemistry II	.3
Chem 228-Organic Chemistry II Lab	.1
English 60-Writing & Research	.3
Social Sciences Elective	.3
Electives	.7
	<u>17</u>

#### JUNIOR YEAR

First Semester	Credit
Chem 51-Elem Quant Chem Analy	.2
Chem 52-Elem Quant Chem Analy Lab	.2
Physics 21-Gen Physics I	.4
Physics 22-Gen Physics Lab I	.1
Stat 213-Applied Eng Stat	.3
Electives	.6
	<u>18</u>

Second Semester	Credit
Chem 251-Intermediate Quan Analy	.4
Chem Elective-3xx Lecture	.3
Chem Elective 3xx Lab	.1
Physics 25-Gen Physics II	.4
Physics 26-Gen Physics Lab II	.1
Humanities Elective	.3
	<u>16</u>

#### SENIOR YEAR

First Semester	Credit
Chem 343-Physical Chem	.3
Humanities Elective Literature	.3
Electives	.9
	<u>15</u>

Second Semester	Credit
Chem 241 or Chem 243-Physical Chem	.3
Chem 242 or Chem 244-Physical Chem Lab	.1
Chem 310-Seminar	.1
Electives	.10
	<u>15</u>

Students must complete a minimum of 130 credit hours for the Bachelor of Science in Chemistry (non-ACS certified) degree. A minimum grade of "C" is required for each Chemistry course counted towards the degree.

A minor in either Mathematics, Physics, Biology, Psychology, or Computer Science must be met. See Undergraduate catalog for courses required for specific minor. Chem 3xx Elective must be from one or more of the following: Chem 321, 328, 342, 346, 351, 355, 361, 362, 363, 371, 373, 375, 381, 384, 385.

This program of study allows students to design, in conjunction with their chemistry advisor, a program for many disciplines including pre-law, business, pre-dentistry, pre-veterinary medicine, as well as pre-medicine. An example of such a program is shown for pre-medical studies. Pre-Medical Chemistry Majors Options. Electives must include:

Bio Sci 110-Gen Bio	.4
Bio Sc 112-Bio Lab	.1
Bio Sc 211-Cellular Bio	.4

#### Chemistry 3xx Electives:

Chem 361-Biochem	.3
Chem 362-Biochem Lab	.2

### Minor in Chemistry

A minor in chemistry requires a minimum of 18 hours of chemistry course work selected in conjunction with a chemistry faculty advisor. The required courses are Chem 1, 2, 3, 4, 8, 221 and either 224 or 226. Three additional hours of chemistry are to be selected from Chem 151, or other Chem 200 and 300 level courses.

## Chemistry Biochemistry Emphasis Area

### FRESHMAN YEAR

First Semester	Credit
Chem 1-General Chemistry	.4
Chem 2-General Chemistry Lab	.1
Chem 4-Intro to Lab Safety Hazardous Materials	.1
Chem 11-Intro to Chemistry	.1
Math 8-Calculus with Analytic Geometry I	.5
English 20-Exposition & Argumentation	.3
History 112,175,176 or Pol Sc 90	.3
	<u>18</u>

Second Semester	
Chem 3-General Chemistry	.3
Chem 8-Qualitative Analysis	.2
Math 21-Calculus with Analytic Geometry II	.5
Bio Sc 211-Cellular Biology	.4
Humanities Elective	.3
	<u>17</u>

### SOPHOMORE YEAR

First Semester	Credit
Chem 221-Organic Chemistry I	.3
Chem 226-Organic Chemistry I Lab	.1
Math 22-Calculus with Analytic Geometry III	.4
Physics 21-General Physics I	.4
Physics 22-General Physics Lab	.1
Literature Elective	.3
	<u>16</u>

Second Semester	
Chem 223-Organic Chemistry II	.3
Chem 228-Organic Chemistry II Lab	.1
Physics 25-General Physics II	.4
Physics 26-General Physics II Lab	.1
Cmp Sc 53 or Cmp Sc 74 & 78-Intro to Prog	.3
Stat 213-Applied Eng Stat	.3
Electives	.3
	<u>18</u>

### JUNIOR YEAR

First Semester	Credit
Chem 343-Intro to Quantum Chemistry	.3
Chem 361-Biochemistry	.3
Chem 362-Biochemistry Lab	.2
English 60-Writing & Research	.3
Social Sciences Elective	.3
Electives	.3
	<u>17</u>

Second Semester	
Chem 51-Quantitative Analysis	.2
Chem 52-Quantitative Analysis Lab	.2
Chem 241-Physical Chemistry	.3
Chem 242-Physical Chem Lab	.1
Chem 363-Intermediary Metabolism	.3
Humanities Elective	.3
Electives	.2
	<u>16</u>

### SENIOR YEAR

First Semester	Credit
Chem 243-Physical Chemistry	.3
Chem 244-Physical Chem Lab	.1
Chem 251-Intermediate Quantitative Analysis	.4

Chem 310-Undergraduate Seminar or Chem 390-Undergraduate Research	.1
Bio Sc 331-Molecular Genetics	.3
Elective	.3
	<u>15</u>

Second Semester	
Chem 237-Inorganic Chemistry	.3
Chem 238-Inorganic Chem Lab	.1
Chem 300-Special Problems	.1
Chem 310-Undergraduate Undergraduate Seminar or Chem 390-Undergraduate Research	.1
Chem 328-Organic Syn & Spec Analy	.3
Social Sciences Elective	.3
Elective	.2
	<u>14</u>

### Notes:

**Grade Requirements:** Students must complete a minimum of 131 credit hours for the Bachelor of Science in Chemistry degree. A minimum grade of "C" is required for each Chemistry course counted towards the degree.

**ROTC:** Basic ROTC may be taken in the freshman and sophomore years, but is not countable towards a degree.

**Electives:** There are thirteen (13) hours of electives. Students planning to attend graduate school are encouraged to incorporate additional higher level chemistry electives, math, and foreign language, including a scientific literature course. Recommended courses include but are not limited to the following.

Biology, 200 and 300 level especially 211  
Math 200 and 300 level, especially 204, 208 and 325  
Physics 200 and 300 level, especially 208, 221, 323 & 341  
Statistics, 200 & 300 level, especially 343, 346 & 353  
Also Ceramic Engineering 391 and 392, or Geology 381  
A foreign language series, French, German or Russian are recommended.

## Chemistry Polymer & Coatings Science Emphasis Area

### FRESHMAN YEAR

First Semester	Credit
Chem 1-General Chemistry	.4
Chem 2-General Chemistry Lab	.1
Chem 4-Intro to Lab Safety Hazardous Materials	.1
Chem 11-Intro to Chemistry	.1
Math 8-Calculus with Analytic Geometry I	.5
English 20-Exposition & Argumentation	.3
History 112,175,176 or Pol Sc 90	.3
	<u>18</u>

Second Semester	
Chem 3-General Chemistry	.3
Chem 8-Qualitative Analysis	.2
Math 21-Calculus with Analytic Geometry II	.5
Electives	.6
	<u>16</u>

**SOPHOMORE YEAR**

First Semester	Credit
Chem 221-Organic Chemistry I . . . . .	3
Chem 226-Organic Chemistry I Lab . . . . .	1
Math 22-Calculus with Analytic Geometry III . . . . .	4
Physics 21-General Physics I . . . . .	4
Physics 22-General Physics Lab . . . . .	1
Electives . . . . .	3
	16
Second Semester	
Chem 223-Organic Chemistry II . . . . .	3
Chem 228-Organic Chemistry II Lab . . . . .	1
Physics 25-General Physics II . . . . .	4
Physics 26-General Physics II Lab . . . . .	1
Cmp Sc 53 or Cmp Sc 74 & 78-Intro to Programming 3	
Stat 213-Applied Eng Stat . . . . .	3
	15

**JUNIOR YEAR**

First Semester	Credit
Chem 343-Intro to Quantum Chemistry . . . . .	3
Chem 381-Polymer Chemistry . . . . .	3
Chem 361-Biochemistry . . . . .	3
English 60-Writing & Research . . . . .	3
Electives . . . . .	4
	16
Second Semester	
Chem 51-Quantitative Analysis . . . . .	2
Chem 52-Quantitative Analysis Lab . . . . .	2
Chem 241-Physical Chemistry . . . . .	3
Chem 242-Physical Chem Lab . . . . .	1
Chem 384-Polymer Science Lab . . . . .	3
Chem 385-Fundamentals of Protective Coating I . . . . .	3
Chem 390-Undergraduate Research . . . . .	1
	15

**SENIOR YEAR**

First Semester	Credit
Chem 243-Physical Chemistry . . . . .	3
Chem 244-Physical Chem Lab . . . . .	1
Chem 251-Intermediate Quantitative Analysis . . . . .	4
Ch Eng 375-Structures & Properties of Polymers . . . . .	3
Chem 390-Undergraduate Research . . . . .	1
Electives . . . . .	6
	18
Second Semester	
Chem 237-Inorganic Chemistry . . . . .	3
Chem 238-Inorganic Chem Lab . . . . .	1
Chem 328-Organic Syn & Spec Analy . . . . .	3
Chem 390-Undergrad Research . . . . .	1
Chemistry Electives . . . . .	3
Electives . . . . .	6
	17

**Notes:**

**Grade Requirements:** Students must complete a minimum of 131 credit hours for a Bachelor of Science-Chemistry degree. A minimum grade of "C" is required for each Chemistry course counted towards the degree.

**ROTC:** Basic ROTC may be taken in the freshman and sophomore years, but is not countable towards a degree.

**Chem 390 - Undergraduate Research:** The undergraduate research must be done in Polymers and Coatings Science.

**Electives:** There are twenty-eight (28) hours of electives. Six (6) elective hours must be completed in the social sciences. Nine (9) elective hours are required in the humanities, exclusive of foreign language. Three of the humanities hours must be literature. Three of the humanities hours are to be at the 100 level or higher. Three (3) hours of elective may be chosen from Materials Science related courses numbered in the 300-series.

Students planning to attend graduate school are encouraged to incorporate additional higher level chemistry electives, math, and foreign language, including a scientific literature course. Recommended courses include but are not limited to the following:

Biology, 200 and 300 level, especially 211  
 Math 200 and 300 level, especially 204, 208 and 325  
 Physics 200 and 300 level, especially 208, 221, 323 & 341  
 Statistics, 200 & 300 level, especially 343, 346 & 353  
 Also, Ceramic Engineering 391 and 392, or Geology 381  
 A foreign language series.

## Chemistry Pre-medicine Emphasis Area

**FRESHMAN YEAR**

First Semester	Credit
Chem 1-General Chemistry . . . . .	4
Chem 2-General Chemistry Lab . . . . .	1
Chem 4-Intro to Lab Safety & Hazardous Materials . . . . .	1
Chem 11-Intro to Chemistry . . . . .	1
Math 8-Calculus with Analytic Geometry I . . . . .	5
English 20-Exposition & Argumentation . . . . .	3
History 112,175,176 or Pol Sc 90 . . . . .	3
	18

**Second Semester**

Chem 3-General Chemistry . . . . .	3
Chem 8-Qualitative Analysis . . . . .	2
Math 21-Calculus with Analytic Geometry II . . . . .	5
Bio Sc 110-General Biology . . . . .	3
Bio Sc 112-General Biology Lab . . . . .	2
Humanities Elective . . . . .	3
	18

**SOPHOMORE YEAR**

First Semester	Credit
Chem 221-Organic Chemistry I . . . . .	3
Chem 226-Organic Chemistry I Lab . . . . .	1
Math 22-Calculus with Analytic Geometry III . . . . .	4
Physics 21-General Physics I . . . . .	4
Physics 22-General Physics Lab . . . . .	1
Bio Sc 211-Cellular Biology . . . . .	4
	17

**Second Semester**

Chem 223-Organic Chemistry II . . . . .	3
Chem 228-Organic Chemistry II Lab . . . . .	1
Physics 25-General Physics II . . . . .	4
Physics 26-General Physics II Lab . . . . .	1
Cmp Sc 53 or Cmp Sc 74 & 78-Intro to Programming 3	
Stat 213-Applied Eng Stat . . . . .	3
Social Sciences Elective . . . . .	3
	18

**JUNIOR YEAR**

First Semester	Credit
Chem 343-Intro to Quantum Chemistry . . . . .	3
Chem 361-Biochemistry . . . . .	3
Chem 362-Biochemistry Lab . . . . .	2
English 60-Writing & Research . . . . .	3
Bio Sc 241-Human Anatomy . . . . .	5
	16
Second Semester	
Chem 51-Quantitative Analysis . . . . .	2
Chem 52-Quantitative Analysis Lab . . . . .	2
Chem 241-Physical Chemistry . . . . .	3
Chem 242-Physical Chem Lab . . . . .	1
Chem 363-Intermediary Metabolism . . . . .	3
Bio Sc 242-Human Physiology . . . . .	5
	16

**SENIOR YEAR**

First Semester	Credit
Chem 243-Physical Chemistry . . . . .	3
Chem 244-Physical Chem Lab . . . . .	1
Chem 251-Intermediate Quantitative Analysis . . . . .	4
Chem 310-Undergraduate Seminar or Chem 390-Undergraduate Research . . . . .	1
Social Sciences Elective . . . . .	3
Literature Elective . . . . .	3
	15
Second Semester	
Chem 237-Inorganic Chemistry . . . . .	3
Chem 238-Inorganic Chem Lab . . . . .	1
Chem 310-Undergraduate Seminar or Chem 390-Undergraduate Research . . . . .	1
Chem 328-Organic Synthesis & Spec. Analysis . . . . .	3
Advanced Chemistry Electives . . . . .	2
Humanities Elective . . . . .	3
	13

**Notes:**

**Grade Requirements:** Students must complete a minimum of 131 credit hours for the Bachelor of Science in Chemistry degree. A minimum grade of "C" is required for each Chemistry course counted towards the degree.

**ROTC:** Basic ROTC may be taken in the freshman and sophomore years, but is not countable towards a degree.

**Chemistry Electives:** The advanced Chemistry Elective is chosen from Chem 321, 331, 346, 351, 381, 385.

**Electives:** At least three hours of the humanities or literature electives are to be at the 100 level or higher.

**Chemistry Courses**

- 1 General Chemistry** (LEC 3.0 and RSD 1.0) A comprehensive study of the general principles of chemistry with emphasis on the fundamental laws and their application in practical computations. The class is divided into smaller sections one day a week for recitation and discussion of problems. Prerequisite: Entrance requirements.
- 2 General Chemistry Laboratory** (LAB 1.0) The laboratory work accompanying general chemistry consists of experiments designed to supplement lectures in Chem 1. Prerequisite: Preceded or ac-

companied by Chem 001 and Chem 004 or equivalent training program approved by UMR.

- 3 General Chemistry** (LEC 3.0) Continuation of course Chem 1 with some emphasis on descriptive chemistry. The ionic theory and mass laws are introduced and applied at advantageous points in the lecture. Prerequisites: Chem 1 and 2.
- 4 Introduction To Laboratory Safety & Hazardous Materials** (LEC 1.0) A systematic study of safe laboratory operations and pertinent regulations of state and federal agencies.
- 5 Accelerated General Chemistry** (LEC 3.0, RSD 1.0, and LAB 1.0) An accelerated version of Chem 1, Chem 2, and Chem 3. Four lectures and three laboratory hours per week. Students who do not meet these entrance requirements must take Chem 1, 2, & 3. Prerequisite: Preceded or accompanied by Chem 4 or an equivalent training program approved by UMR. A minimum score of 60 for the sum of the MMPT and the ACT N. SCI. test scores with neither score below 27.
- 8 Qualitative Analysis** (LAB 2.0) This course is to accompany the study of the metals in general chemistry and is devoted to the qualitative separation and detection of the metals. Prerequisite: Preceded or accompanied by Chem 3 and Chem 4 or an equivalent training program approved by UMR.
- 10 General Chemistry For Non-Science Majors** (LEC 3.0) A one semester introduction to chemistry designed to acquaint the student with the philosophy of the chemist's approach to problem solving and the contribution of chemistry to society. Prerequisite: Entrance requirements.
- 11 Introduction To Chemistry** (LEC 1.0) Introduction to chemistry, its intellectual and professional opportunities. Students will be acquainted with various areas of chemistry and with departmental and campus facilities useful to their future studies. Required of all freshman chemistry majors; encouraged for undergraduate transfer chemistry majors.
- 12 Invitational Seminar** (LEC 1.0) This invitational seminar will introduce the student to research in chemistry. A series of seminars will be presented by faculty and outside speakers on current topics in chemical research. Prerequisite: Chem 1 or Chem 5.
- 14 Elementary Analytical Chemistry** (LEC 3.0 and LAB 2.0) A study of the general theories for separation and identification of metals. It also includes the fundamental principles of quantitative analysis. Prerequisite: Preceded or accompanied by Chem 3 and Chem 4 or an equivalent training program approved by UMR.
- 51 Elementary Quantitative Chemical Analysis** (LEC 2.0) A treatise of the fundamental principles of analytical chemistry and their application in analytical methods. Prerequisite: Preceded or accompanied by Chem 3 or to be accompanied by Chem 52.

- 52 Elementary Quantitative Chemical Analysis** (LAB 2.0) The application of the principles of analytical chemistry in gravimetric and volumetric determinations. Prerequisite: To be accompanied by Chem 51 and preceded or accompanied by Chem 4 or an equivalent training program approved by UMR.
- 100 Special Problems** (IND 0.0-6.0) Problems or readings on specific subjects or projects in the department. Consent of instructor required.
- 101 Special Topics** (Variable 0.0-6.0) This course is designed to give the department an opportunity to test a new course. Variable title.
- 110 Master Student** (LEC 1.0) Master Student is an orientation course for new and transfer students that addresses transition needs.
- 151 Quantitative Chemical Analysis** (LEC 3.0 and LAB 2.0) A study of the fundamental principles of quantitative analytical chemistry and the application of such principles to gravimetric, volumetric, colorimetric, and electroanalytical determinations. Prerequisites: Chem 8, 241 and preceded or accompanied by Chem 4 or an equivalent training program approved by UMR.
- 200 Special Problems** (IND 0.0-6.0) Problems or readings on specific subjects or projects in the department. Consent of instructor required.
- 201 Special Topics** (Variable 0.0-6.0) This course is designed to give the department an opportunity to test a new course. Variable title.
- 203 MST General Chemistry Lab** (LAB 1.0) The laboratory work accompanying the MST chemistry courses consists of experiments designed to supplement the lecture work in chemistry. This course is primarily intended for secondary education science teachers. Credit will not be given for both Chemistry 2 and Chemistry 203. Prerequisite: Entrance requirements for the MST program. Preceded or accompanied by Chem 204 or equivalent training program approved by UMR.
- 204 Lab Safety and Environmental Safety** (LEC 1.0) A systematic study of safe laboratory operations and pertinent regulations of state and federal agencies. This course is primarily intended for secondary education science teachers. Credit will not be given for both Chemistry 4 and Chemistry 204. Prerequisite: Entrance requirements for the MST program.
- 210 Seminar** (IND 0.0-6.0) Discussion of current topics.
- 212 Science Teaching With In-Classroom Computers** (LEC 2.0 and LAB 1.0) Lectures with laboratory sessions that provide student with indepth knowledge of computer hardware operation, software application and instructional methods. A computer is required for the course. Student full participation is expected as a partial measure of course completion. Prerequisite: Elementary or secondary science teacher certification.
- 221 Organic Chemistry I** (LEC 3.0) A study of the theory and practice of the fundamental reactions of organic compounds. Prerequisite: Chem 3 or 8.
- 222 Organic Chemistry I Lab** (LAB 1.0) A study of basic organic chemical laboratory procedures. Prerequisites: Preceded or accompanied by Chem 221 and Chem 4 or an equivalent training program approved by UMR.
- 223 Organic Chemistry II** (LEC 3.0) A continuation of Chem 221. Prerequisite: Chem 221.
- 224 Organic Chemistry Lab** (LAB 1.0) The use of organic chemical laboratory procedures. For chemical engineering majors only. Prerequisite: Preceded or accompanied by Chem 223 and Chem 4 or an equivalent training program approved by UMR.
- 225 Bioorganic Chemistry I** (LEC 4.0) This course consists of four parts: 1) Structure, bonding, and nomenclature; 2) hydrocarbons (alkanes, alkenes, and alkynes), conjugated systems, ultraviolet and visible spectroscopy, stereochemistry, resonance, and molecular orbital theory; 3) substitution and elimination reactions, and 4) identification of organic compounds via infrared and NMR spectroscopy. Prerequisites: Chem 1, 2, 3; or Chem 5.
- 226 Organic Chemistry I Lab** (LAB 1.0) Laboratory involves purification techniques, simple and multistep synthesis and spectroscopic identification of organic functional groups. Prerequisites: Preceded or accompanied by Chem 221 and either Chem 4 or an equivalent training program approved by UMR.
- 227 Bioorganic Chemistry II** (LEC 4.0) This course consists of three parts. The first part will cover aromaticity and reactions of aromatic compounds, the second part will cover carbonyl compounds, amines and their reactions, and the third part will cover bioorganic compounds that include carbohydrates, aminoacids, peptides, proteins, lipids, nucleosides, nucleotides, and nucleic acids. Prerequisite: Chem 225.
- 228 Organic Chemistry II Lab** (LAB 1.0) Continuation of Chem 226. Prerequisites: Chem 226, preceded or accompanied by Chem 223 and Chem 4 or an equivalent training program approved by UMR.
- 237 Inorganic Chemistry** (LEC 3.0) A study of modern concepts of atomic structure, chemical bonding, thermodynamics and kinetics as related to the periodic relationship of the elements. Reference to topics of current interests as applied to the above areas.
- 238 Inorganic Chemistry Laboratory** (LAB 1.0) Synthesis and characterization of inorganic chemicals, high and low temperature syntheses, inert atmosphere and vacuum manipulations, electrochemistry, magnetochemistry, spectroscopy (NMR, IR, UV/VIS), superconductivity. Prerequisites: Preceded or accompanied by Chem 237 and Chem 4 or an equivalent training program approved by UMR.
- 240 Physical Chemistry** (LEC 3.0) A study of the laws of thermodynamics and their applications to chemical systems. Prerequisites: Chem 51 and 52, Math 22, Physics 25.



- 241 Physical Chemistry** (LEC 3.0) A study of the laws of thermodynamics and their applications to the states of matter, solutions, and equilibria. Prerequisites: Math 22, Physics 25.
- 242 Physical Chemistry Laboratory** (LAB 1.0) Some typical operations of experimental physical chemistry. Prerequisites: Preceded or accompanied by Chem 241 and Chem 4 or an equivalent training program approved by UMR.
- 243 Physical Chemistry** (LEC 3.0) A study of kinetic theory, chemical kinetics, electromotive force and ionic equilibria. Prerequisite: Chem 241 or consent of department.
- 244 Physical Chemistry Laboratory** (LAB 1.0) A continuation of Chem 242. Prerequisite: Preceded or accompanied by Chem 243 or 240 and Chem 4 or an equivalent training program approved by UMR.
- 251 Intermediate Quantitative Analysis** (LEC 3.0 and LAB 1.0) The course provides an overview on the applications of atomic spectroscopy, electro-analytical x-ray, electron spectroscopy, and separation techniques for chemical analysis. Prerequisites: Chem 4, Chem 223.
- 300 Special Problems** (IND 0.0-6.0) Problems or readings on specific subjects or projects in the department. Prerequisite: Preceded or accompanied by Chem 4 or an equivalent training program approved by UMR. Consent of instructor required.
- 301 Special Topics** (Variable 0.0-6.0) This course is designed to give the department an opportunity to test a new course. Variable title.
- 305 Advanced Chemical Preparations And Techniques** (LEC 1.0 and LAB 2.0) A course designed to develop facility in the use of equipment and techniques commonly used in advanced work in experimental chemistry. Prerequisite: Preceded or accompanied by Chem 4 or an equivalent training program approved by UMR.
- 310 Undergraduate Seminar** (RSD 1.0) Written and oral presentations of current topics in chemistry. This course may serve as part of the capstone requirement for chemistry majors.
- 321 Intermediate Organic Chemistry I** (LEC 3.0) An advanced course designed to give the student a mastery of the fundamentals of organic chemical reactions and theory. Prerequisites: Chem 223 and 243.
- 323 Intermediate Organic Chemistry II** (LEC 3.0) A systematic study of organic reactions, their mechanisms and synthetic applications. Prerequisites: Chem 223 and 243.
- 325 Industrial Chemical Processes** (LEC 3.0) Detailed study of various industrial chemical manufacturing processes including underlying chemistry, reaction pathways and separation processes. Prerequisite: Ch Eng 235 or Chem 221, or graduate standing. (Co-listed with Ch Eng 389)
- 328 Organic Synthesis And Spectroscopic Analysis** (LEC 1.0 and LAB 2.0) Advanced methods for the multistep synthesis and characterization of organic compounds. Modern instrumental methods of identification of organic compounds. Prerequisites: Chem 4, Chem 223, Chem 228.
- 331 Selected Topics In Inorganic Chemistry** (LEC 3.0) A study of inorganic chemistry with emphasis on physical methods. General subjects covered include: molecular structure, bonding, complexes, spectroscopy, and reaction rates.
- 338 Advanced General Chemistry For Secondary Teachers** (LEC 3.0 and LAB 1.0) A study of the general principles of chemistry with emphasis on the fundamental laws and their application in practical applications. The laboratory experiments are designed to support lectures and to be used as teaching demonstrations in high schools. Prerequisite: One year of college chemistry.
- 343 Introduction To Quantum Chemistry** (LEC 3.0) A study of molecular structures and spectroscopy, statistical thermodynamics, kinetic theory, chemical kinetics, crystals, and liquids. Prerequisites: Math 22 & Physics 25 or equivalents.
- 344 Advanced Physical Chemistry** (LEC 3.0) Advanced undergraduate treatments of special topics of physical chemistry, which may include statistical mechanics, kinetics, group theory, or spectroscopy. Prerequisite: Chem 343.
- 346 Chemical Thermodynamics** (LEC 3.0) A study of the laws of thermodynamics with application to chemical systems. Emphasis is placed on partial molal functions. Prerequisite: Chem 243.
- 349 The Physical Chemistry Of Colloidal Dispersions** (LEC 3.0) The stability of colloidal systems is treated using the kinetic approach with interparticle potentials. The results are extended to practical systems of microemulsions, emulsions and foams. Prerequisite: Chem 343.
- 351 Advanced Analytical Chemistry** (LEC 3.0) Theoretical and practical aspects of modern analytical chemistry. Prerequisite: Chem 251.
- 355 Instrumental Methods Of Chemical Analysis** (LEC 3.0 and LAB 1.0) Principles and analytical applications of molecular spectroscopy, chromatographic separations, mass spectrometry, and radiochemistry. A brief overview of instrument electronics, signal generation and processing, and automated analysis is also provided. Prerequisites: Chem 4, Chem 52, Chem 223, Chem 243.
- 361 General Biochemistry** (LEC 3.0) A resume of the important aspects of quantitative and physical chemistry in biochemical processes. General subjects covered include: proteins, nucleic acids, enzymes, carbohydrates and lipids. Prerequisites: Chem 223 and Bio 211.
- 362 General Biochemistry Laboratory** (LAB 2.0) Experiments are integrated with the lectures and cover the chemical and physical properties of proteins, enzymes, nucleic acids, carbohydrates and lipids. Prerequisites: Preceded or accompanied by Chem 361 and Chem 4 or an equivalent training program approved by UMR.
- 363 Metabolism** (LEC 3.0) A continuation of Chem 361. Catabolism and anabolism of carbohydrates, lipids, proteins, and nucleic acids. Photosynthesis,

oxidative phosphorylation and membranes. Prerequisite: Chem 361 or Chem 225; Chem 227.

- 367 Industrial Biochemistry** (LEC 3.0) A study of the problems involved in the utilization of biological systems for the production of bulk chemicals, the preparation of biologicals and the treatment of waste from plants producing biologicals and foodstuffs. Prerequisite: Junior standing.
- 371 Nuclear And Radiochemistry** (LEC 3.0 and LAB 1.0) A study of the fundamentals of nuclear and radiochemistry including properties of radiations; effect of radiation on materials, production, measurement and use of radioactive tracers; and the chemistry of reactor materials. Laboratory training includes radiochemistry technology. Prerequisites: Physics 107 or 207 and preceded or accompanied by Chem 4 or an equivalent training program approved by UMR.
- 373 Atmospheric Chemistry** (LEC 3.0) A chemical study of the troposphere including composition; nucleation, growth stability, distribution, diffusion, and fallout of aerosols; and meteorological aspect. Prerequisite: Chem 243.
- 375 Principles Of Environmental Monitoring** (LEC 3.0) This course provides an overview of environmental monitoring methodologies. Discussion covers thermodynamic and kinetic processes that affect chemical transport and fate in the environment. Federal environmental regulations and remediation technologies are also covered with specific examples. Prerequisites: Chem 221, Physics 25.
- 381 Chemistry And Inherent Properties Of Polymers** (LEC 3.0) A basic study of the organic chemistry of natural and synthetic high polymers, their inherent properties and their uses in plastic, fiber, rubber, resin, food, paper and soap industries. Prerequisite: Chem 223.
- 384 Polymer Science Laboratory** (LEC 1.0 and LAB 2.0) Lectures and laboratory experiments dealing with polymerization reactions, solution properties and bulk or solid properties will be presented. Each student will prepare polymers and carry out all characterization experiments on actual samples. Prerequisite: Chem 381 or Ch Eng 375, preceded or accompanied by Chem 4 or an equivalent training program approved by UMR.
- 385 Fundamentals Of Protective Coating I** (LEC 3.0) Study of the basic principles of protective coatings with particular reference to the paint and varnish industry. Classifications, manufacture, properties and uses of protective coatings. Prerequisite: Chem 223.
- 390 Undergraduate Research** (IND 0.0-6.0) Designed for the undergraduate student who wishes to engage in research. Does not lead to the preparation of a thesis. Not more than six (6) credit hours allowed for graduation credit. Subject and credit to be arranged with the instructor. Preparation of a written, detailed report is required of the student. Prerequisite: Must meet departmental

requirements for instruction in laboratory safety. Consent of instructor required.

# Computer Science

Bachelor of Science

Master of Science

Doctor of Philosophy

The Computer Science Department educates students in a broad range of areas in computer science. Computer Science students take courses in the design and implementation of software systems and the algorithms (problem solving techniques) used to solve “real world” problems in business, industry, and engineering or as preparation for graduate study. Students are given both the depth and breadth of computer science so necessary to keep them competitive in today’s fast-changing world. While instruction and research are on the leading edge of computing, the Department endeavors to keep class sizes small to facilitate student and faculty interactions.

In addition to computer science courses, the Department’s undergraduate program requires students to be educated in a broad range of general education courses. During their senior year, all computer science seniors take the capstone course. This course gives them “real world” experience working in teams composed of fellow students and practicing computer scientists. These teams design, implement, test, and maintain actual software systems. (The sample curriculum shown below provides more detail.)

The Computer Science faculty has a broad range of scholarly interests which include computer security, web databases and wireless systems, intelligent systems (artificial intelligence, machine learning, evolutionary computation), data mining, bioinformatics, parallel and distributed processing, software engineering, computer networks, scientific visualization, computational science, and algorithms. The research being done in these areas involves both undergraduates and graduates and supports the department’s three major areas of excellence; software lifecycle, critical infrastructure protection, and bioinformatics. Faculty are not only actively doing research in these areas, they integrate their research experiences into the classroom.

Computer science graduates from UMR work in a variety of environments. Some work for large companies, others prefer smaller companies. Many of our graduates have started their own companies. Regardless of their choice of employment, UMR Computer Science graduates are in high demand as evidenced by the number of companies that specifically recruit our graduates.

The Computer Science Department at UMR makes use of both its own computer learning centers (CLCs) as well as university CLCs. The Department maintains several CLCs including the following instructional laboratories:

- Instructional Workstation Laboratory that provides Unix/Linux workstations,

- Instructional PC Laboratory consisting of PC computing platforms

Research laboratories provide support for both undergraduate and graduate students. These laboratories include:

- McDonnell Douglas Software Engineering Laboratory
- Bioinformatics Laboratory
- Experimental Computation Laboratory
- Data Mining & Knowledge Discovery Laboratory
- Web and Wireless Computing (W2C)
- Natural Computation Lab
- Algorithms & Complexity

Cable and Wireless Network Access is available to all students, faculty and staff.

For further information, visit the Department's web page at <http://www.cs.umn.edu> or contact us at 573-341-4491 or at: [csdept@umn.edu](mailto:csdept@umn.edu).

## Faculty

### Professors:

Fikret Ercal (Department Chair), Ph.D., Ohio State  
 Bruce McMillin, Ph.D., Michigan State  
 Chaman Sabharwal, Ph.D., UIUC  
 Ralph Wilkerson, Ph.D., SIU-Carbondale

### Associate Professors:

Frank Liu, Ph.D., Texas A & M  
 Franck Xia, Ph.D., University of Paris VI

### Assistant Professors:

Maggie Cheng, Ph.D., University of Minnesota  
 Jennifer Leopold, Ph.D., University of Kansas  
 Sanjay Madria, Ph.D., Indian Institute of Technology  
 Daniel Tauritz, Ph.D., Leiden University  
 Mayur Thakur, Ph.D., Rochester University  
 Wen-Bin (Vincent) Yu, Ph.D., University of Louisville  
 Ying Zhao, Ph.D., University of Minnesota

### Teaching Associate:

David M. Mentis, M.S., UMR

### Undergraduate Coordinator/Freshman Advisor & Transfer Advisor:

Clayton Price, M.S., UMR

### Emeritus Faculty:

Thomas Baird, M.S., UMR  
 Billy Gillett, Ph.D., Oklahoma State  
 Ralph E. Lee, M.A., Indiana  
 Howard D. Pyron, Ph.D., Iowa State  
 Kellam Rigler, Ph.D., Pittsburgh  
 Thomas J. Sager, Ph.D., New Mexico  
 Frank G. Walters, M.S., UMR  
 George W. Zobrist, Ph.D., Missouri-Columbia

### Adjunct Faculty:

William E. Bond, Ph.D., Rensselaer  
 Randy Cannis, JD, UMC  
 Chris Merz  
 William Van Stoecker, M.D., UMC

## Bachelor of Science

### Computer Science

(128 Credit Hours)

All computer science majors must earn a "C" or better

grade in each of the following courses: Cmp Sc 53, Cmp Sc 54, Cmp Sc 153, Cmp Sc 158, and Cmp Sc 253.

All computer science majors must earn a minimum cumulative grade point average of 2.00 for all computer science courses presented to satisfy the required and elective computer science requirements.

All computer science majors must earn a minimum cumulative grade point average of 2.00 for all computer science courses taken at UMR which are presented to satisfy the required and elective graduation requirements.

## Sample Course of Study

### FRESHMAN YEAR

First Semester	Credit
Cmp Sc 1-Intro to Computer Science . . . . .	1
Cmp Sc 53-Intro to Programming . . . . .	3
Cmp Sc 54-Intro to Prog Lab . . . . .	1
English 20-Exposition & Argumentation . . . . .	3
Math 8-Calculus with Analytic Geometry I . . . . .	5
Humanities Elective <sup>(5)</sup> . . . . .	3
	<u>16</u>

### Second Semester

Cmp Sc 153-Data Structures I . . . . .	3
Cmp Sc 158-Discrete Math for Cmp Sc . . . . .	3
Math 21-Calculus with Analytic Geometry II . . . . .	5
Laboratory science course(s) <sup>(1)</sup> . . . . .	5
	<u>16</u>

### SOPHOMORE YEAR

First Semester	Credit
Cmp Sc 253-Data Structures II . . . . .	3
Math 22-Calculus with Analytic Geometry III . . . . .	4
Literature Elective <sup>(5)</sup> . . . . .	3
Physics Elective <sup>(3)</sup> . . . . .	4
Sp&MS 85-Intro to Speech <sup>(4)</sup> . . . . .	3
	<u>17</u>

### Second Semester

Cmp Sc 238-File Struct & Intro Database Sys . . . . .	3
Cmp Eng 111-Intro to Cmp Eng <sup>(12)</sup> . . . . .	3
Math 208-Linear Algebra I <sup>(7)</sup> . . . . .	3
Physics Elective <sup>(3)</sup> . . . . .	4
Stat 215-Engineering Statistics <sup>(6)</sup> . . . . .	3
	<u>16</u>

### JUNIOR YEAR

First Semester	Credit
History Elective <sup>(2)</sup> . . . . .	3
Cmp Sc 284-Intro Operating Systems . . . . .	3
Cmp Eng 213-Digital Systems Design <sup>(12)</sup> . . . . .	3
Social Science Elective <sup>(2)</sup> . . . . .	3
Free Elective <sup>(8)</sup> . . . . .	3
	<u>15</u>

### Second Semester

Cmp Sc 236-Prog Languages & Translators . . . . .	3
Social Science Elective <sup>(2)</sup> . . . . .	3
Cmp Sc 228-Intro to Numerical Methods . . . . .	3
English 60-Writing and Research <sup>(13)</sup> . . . . .	3
Cmp Sc 206-Software Engineering I . . . . .	3
	<u>15</u>

## 72 — Computer Science

### SENIOR YEAR

	Credit
First Semester	
Cmp Sc Electives <sup>(9)</sup> . . . . .	6
Eng/Science Electives <sup>(10)</sup> . . . . .	6
Humanities/Social Science Elective <sup>(11)</sup> . . . . .	3
Cmp Sc 397-Software Systems Development I . . . . .	3
	18
Second Semester	
Cmp Sc Electives <sup>(9)</sup> . . . . .	6
Eng/Science Elective <sup>(10)</sup> . . . . .	3
Humanities/Social Science Elective <sup>(11)</sup> . . . . .	3
Free Elective <sup>(8)</sup> . . . . .	3
	15

- <sup>1)</sup> Any science lecture-laboratory course or course pair totaling at least four hours credit. The laboratory is mandatory in all cases. These course(s) may be selected from: Chem 1, 2 and 4 and 5; Bio Sc 110 and 112; Physics 9, 11 and 10; and Geology 51.
- <sup>2)</sup> Any nine hours that include courses from at least two of the following areas: economics, history, political science, psychology, or sociology. One course must satisfy the Missouri and U.S. Constitution requirement. (see Cmp Sc web page)
- <sup>3)</sup> Physics 23 and 24 or Physics 21-22/27 and Physics 25-26/28.
- <sup>4)</sup> Sp & MS 85 or Sp & MS 283.
- <sup>5)</sup> One literature and one humanities course in any of the humanities.
- <sup>6)</sup> Stat 215 or 343.
- <sup>7)</sup> Math 203 or 208.
- <sup>8)</sup> Courses chosen from any field so that 128 hours are completed. These and only these courses may be taken pass/fail and only one course may be taken pass/fail each semester. Some courses such as algebra, trigonometry and the first two years of ROTC do not count toward the 128 hours.
- <sup>9)</sup> Any twelve hours from computer science courses, at least six hours must be from 300 level. No X7X courses will be accepted.
- <sup>10)</sup> Any nine hours chosen from departments that offer a B.S., (or Basic Engineering), excluding computer science.
- <sup>11)</sup> Any six hours in humanities or social science.
- <sup>12)</sup> Laboratory not required.
- <sup>13)</sup> Or English 160 - Technical Writing.

### Computer Science Minor Curriculum

A student with a minor in computer science must meet the following requirements:

- A) Cmp Sc 153 and 12 elective hours in computer science beyond Cmp Sc 53, 54, 73 & 77 or 74 & 78.
- B) A member of the computer science faculty will serve as the student's minor advisor. The student and his/her minor advisor will plan a course of study to meet the specific interests and needs of the student.
- C) Students pursuing a minor in computer science must earn a "C" or better, in Cmp Sc 53, Cmp Sc 54, Cmp Sc 153, Cmp Sc 158, and Cmp Sc 253 if any of these courses are taken for the minor.

### Bioinformatics Minor

Students majoring in computer science are eligible to pursue a minor in bioinformatics. See the description of the bioinformatics minor under the heading Arts and Sciences.

### Computer Science Courses

- 1 Introduction To Computer Science (LEC 1.0)**  
This course is devoted to an introduction of various areas of Computer Science, the faculty members, and lab equipment. Computer ethics will be discussed in several lectures.
- 53 Introduction To Programming (LEC 3.0)** Programming design and development using C++. Emphasis placed on problem solving methods using good programming practices and algorithm design and development. Topics included are syntax/semantics, logical, relational and arithmetic operators, decision branching, loops, functions, file I/O, arrays, output formatting, C-strings, and an introduction to Object-Oriented Programming including the development and use of classes. Prerequisite: Accompanied by Cmp Sc 54.
- 54 Introduction To Programming Laboratory (LAB 1.0)** Practical applications of concepts learned in Computer Science 53. Hands-on instruction in C++ developing, debugging, and testing programming projects. Prerequisite: Accompanied by Computer Science 53.
- 71 Introduction To Basic (LEC 3.0)** An introduction to microsoft and IBM PC BASIC. Emphasis on language syntax, structured programming and problem solving. For teachers and persons in related occupations. To be offered on sufficient demand. This course cannot be used toward a Cmp Sc degree.
- 72 Software Application On The Pc (LEC 3.0)** An introduction to operating systems, word processing, spread sheets, and data base manipulation. A postbaccalaureate course designed for teachers and persons in related occupations. Will be offered on sufficient demand. This course cannot be used toward a computer science degree.
- 73 Basic Scientific Programming (LEC 2.0)** Introduction to the structure of programs and programming techniques in Fortran to solve science and engineering problems. Topics include data representation, basic solutions of numerical problems and the debugging and verification of programs. Prerequisite: Entrance requirements.
- 74 Introduction To Programming Methodology (LEC 2.0)** Basic structured programming and problem solving techniques using C++. Development, debugging, and testing of programs, data representation. Topics to include syntax/semantics, operators, loops, decision branching, arrays, file I/O. This course is a terminal course for non-majors and is not sufficient for entry into Computer Science 153.
- 77 Computer Programming Laboratory (LAB 1.0)** A laboratory to accompany Cmp Sc 73 which em-

- phasizes the designing, writing and debugging of programs in Fortran. Prerequisite: Accompanied by Cmp Sc 73.
- 78 Programming Methodology Laboratory** (LAB 1.0) A hands-on introduction to structured programming in C++. Development, coding, debugging, and execution of programming concepts discussed in Computer Science 74. Prerequisite: Accompanied by Computer Science 74.
- 101 Special Topics** (Variable 0.0-6.0) This course is designed to give the department an opportunity to test a new course. Variable title.
- 137 Assembly Language Programming** (LEC 3.0) An investigation of the logical basis of a particular computer from the programmer's viewpoint. Topics will include: Machine representation of numbers and characters, instruction formats, machine operations and addressing techniques. Additional topics may include machine-level input/output and interrupt structure. Numerous problems will be worked using a basic assembler language. Prerequisites: Cmp Sc 53 with a grade of "C" or better.
- 153 Data Structures I** (LEC 3.0) A continuation of the development of structured programming concepts and their use in program development. Stacks, queues, linked list, arrays, trees, sorting and searching will be taught together with their use in implementations of a number of algorithms. Prerequisites: Grade of "C" or better in Cmp Sc 53.
- 158 Discrete Mathematics For Computer Science** (LEC 3.0) A rigorous treatment of topics from discrete mathematics which are essential to computer science. Principal topics include: formal logic (propositional & predicate), proof techniques, mathematical induction, program correctness, sets, combinatorics, probability, relations, functions, matrices, graph theory and graph algorithms. Prerequisite: Comp Sci 53 or at least sophomore standing.
- 200 Special Problems** (IND 0.0-6.0) Problems or readings on specific subjects or projects in the department. Consent of instructor required.
- 201 Special Topics** (Variable 0.0-6.0) This course is designed to give the department an opportunity to test a new course. Variable title.
- 202 Cooperative Work Training** (IND 1.0-5.0) On-the-job experience gained through cooperative education with industry, with credit arranged through departmental cooperative advisor. Grade received depends on quality of reports submitted and work supervisors evaluation.
- 206 Software Engineering I** (LEC 3.0) Development of methodologies useful in the software engineering classical life cycle. This includes: requirements, design, implementation, and testing phases. These methodologies are reinforced through utilization of a CASE tool and a group project. Prerequisite: Cmp Sc 253.
- 210 Seminar** (IND 0.0-6.0) Discussion of current topics.
- 228 Introduction To Numerical Methods** (LEC 3.0) Finite difference interpolation, numerical differentiation and integration, linear systems of equations, solution of nonlinear equations, numerical solution of ordinary differential equations, computational techniques and the programming of a large number of problems on digital computers. Prerequisite: Math 22 and programming competency.
- 234 Introduction To Computer Organization And Assembly** (LEC 3.0) A detailed study designed to teach the building blocks of a computer system, assembly language programming and the basic computer organization concepts. Subjects include digital logic, performance issues, machine & assembly language, binary arithmetic, and the structure of an ALU. Prerequisites: Cmp Sc 153 and Cmp Sc 158.
- 235 Computer Organization** (LEC 3.0) A detailed study of computer organization concepts and the components of a computer system including control unit, microprogramming, pipelining, memory hierarchy, cache design, virtual memory, I/O devices, and a brief introduction to parallel processors. Prerequisite: Cmp Sc 234.
- 236 Programming Languages And Translators** (LEC 3.0) Covers basic design of programming languages, compilers and interpreters. The concepts of syntax, variables, expressions, types, scope, functions, procedures, statements, I/O, exception handling and concurrency are introduced. The manner in which various programming languages handle these concepts is discussed. Prerequisite: Cmp Sc 253.
- 238 File Structures And Introduction To Database Systems** (LEC 3.0) Course covers major topics in file structures and database systems including techniques for disk access and organization, record and file structures, index structures, sequential file, dense/sparse and secondary indexes, B-trees; range queries, insertion/deletion, hash tables, fundamentals of database systems, the ER model, relational model, algebra and SQL. Prerequisite: Cmp Sc 153.
- 253 Data Structures II** (LEC 3.0) A continuation of the study of data structures and abstract data types with emphasis on complexity, performance, and correctness. Topics will include tree balancing algorithms, self-balancing trees, networks and graph algorithms, event simulation, and memory management. Prerequisites: Cmp Sc 158 and (Cmp Sc 153 or 274).
- 260 Introduction To Operations Research** (LEC 3.0) A survey of linear programming, dynamic programming, transportation and network theory (PERT, traveling salesman and shortest route problems), assignment problem, equipment replacement, scheduling problem, inventory control, decision theory, queueing theory, game theory and simulation. The emphasis will be on methodology. Prerequisite: Stat (116 or 213 or 215) and programming competency.

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- 273 Software Systems Survey I** (LEC 1.5 and LAB 1.5) Language concepts, programming design and development using Pascal and assembler language, introduction to large machine architecture, language description techniques. Prerequisite: Programming competency.
- 274 Software Systems Survey II** (LEC 1.5 and LAB 1.5) Introduction to system software; assemblers, macro processors, link editors and loaders, compiler concepts, and operating system concepts. Additional topics include structured programming concepts; and basic file and data structure concepts (indexed sequential organization, hash coding, linked lists, access methods). Prerequisite: Cmp Sc 273 or grade of "B" or better in both Pascal (Cmp Sc 53) and Assembly Language (Cmp Sc 137).
- 284 Introduction To Operating Systems** (LEC 3.0) This course teaches the concepts, structure, and mechanisms of Operating Systems. Topics include process management, concurrency, synchronization, deadlock, multithreading, memory management, scheduling, and internetworking. Special emphasis is given to Unix and its modern-day derivatives. Prerequisites: Cmp Sc 153 and Cmp Sc 158 and Cp Eng 213.
- 285 Computer Network Concepts And Technology** (LEC 3.0) This course will introduce computer network concepts and will survey the current and evolving technology for the construction, operation, and management of those networks. Both hardware and software issues will be addressed with a focus on local area networks. Prerequisite: Cmp Sc 284.
- 300 Special Problems** (IND 0.0-6.0) Problems or readings on specific subjects or projects in the department. Consent of instructor required.
- 301 Special Topics** (Variable 0.0-6.0) This course is designed to give the department an opportunity to test a new course. Variable title.
- 303 Multimedia Systems** (LEC 3.0) This course introduces the concepts and components of Multimedia information systems. Topics include: Introduction to Multimedia Data, Multimedia Data Compression, Techniques and Standards, Indexing and Retrieval, Data Storage Organization, Communication and Synchronization, Applications-Media-OnDemand Systems, Video Conferencing, Digital Libraries. Prerequisite: Cmp Sc 153.
- 304 Database Systems** (LEC 3.0) This course introduces the advanced database concepts of normalization and functional dependencies, transaction models, concurrency and locking, timestamping, serializability, recovery techniques, and query planning and optimization. Students will participate in programming projects. The course assumes students have an introductory course in database systems. Prerequisites: (Cmp Sc 238 or 274) and Cmp Sc 158.
- 307 Software Testing And Quality Assurance** (LEC 3.0) It covers unit testing, subsystem testing, system testing, object-oriented testing, testing specification, test case management, software quality factors and criteria, software quality requirement analysis and specification, software process improvement, and software total quality management. Prerequisite: Cmp Sc 253.
- 308 Object-Oriented Analysis And Design** (LEC 3.0) This course will explore principles, mechanisms, and methodologies in object-oriented analysis and design. An object-oriented programming language will be used as the vehicle for the exploration. Prerequisite: Cmp Sc 253.
- 310 Seminar** (IND 0.0-6.0) Discussion of current topics. Prerequisite: Senior standing.
- 311 Bioinformatics** (LEC 3.0) The course will familiarize students with the application of computational methods to biology, as viewed from both perspectives. It will introduce problems in molecular, structural, morphological, and biodiversity informatics, and will discuss principles, algorithms, and software to address them. Prerequisite: Junior standing or above. (Co-listed with Bio Sci 311)
- 317 Intellectual Property For Computer Scientists** (LEC 3.0) A presentation of the relationship between the law of intellectual property and computer science. Topics include the application of copyright principles to computer programs, protection of computer programs through patents and trade secret law, and the effect of various agreements which are frequently encountered by the computer scientist. Prerequisite: Senior or graduate standing.
- 319 Management Of Computing Services** (LEC 3.0) A thorough survey of the management of computing facilities and services, including selection and evaluation of hardware and software, cost analysis, scheduling, security, privacy, budgets, documentation, effective programming, system planning, project management and data communications. Prerequisite: Consent of instructor required.
- 328 Object-Oriented Numerical Modeling I** (LEC 3.0) A study of object-oriented modeling of the scientific domain. Techniques and methodologies will be developed enabling the student to build a class library of reusable software appropriate for scientific application. Applications will be drawn from mechanics, finance, and engineering. Prerequisites: Comp Sci 228 and Comp Sci 153 and one of Math 208, 203, 229.
- 329 Object-Oriented Numerical Modeling II** (LEC 3.0) A continued study of object-oriented modeling of the scientific domain. Advanced applications include models posed as balance laws, integral equations, and stochastic simulations. Prerequisite: Cmp Sc 328.
- 330 Automata Theory** (LEC 3.0) Description of the extended Chomsky hierarchy and the relation of Chomsky language classes to grammars automata. Use of languages, grammars and automata in

- the compilation of programming languages. Introduction to decidability. Prerequisite: Cmp Sc 158.
- 333 The Structure Of A Compiler** (LEC 3.0) Review of Backus normal form language descriptors and basic parsing concepts. Polish and matrix notation as intermediate forms, and target code representation. Introduction to the basic building blocks of a compiler: syntax scanning, expression translation, symbol table manipulation, code generation, local optimization, and storage allocation. Prerequisites: Cmp Sc 236 or 274 and Cmp Sc 253 (or graduate standing).
- 342 Java Gui & Visualization** (LEC 3.0) Fundamentals of Java Swing Foundation Classes, Java System Language Specifics, Graphical User Interfaces, Images, Audio, Animation, Networking, and Threading. Visualization of Algorithms. GUI Elements include Event Driven Programming, Interaction with Mouse and KeyBoard, Window Managers, Frames, Panels, Dialog Boxes, Borders. Prerequisite: Cmp Sc 253 or equivalent.
- 343 Interactive Computer Graphics** (LEC 3.0) Applications and functional capabilities of current computer graphics systems. Interactive graphics programming including windowing, clipping, segmentation, mathematical modeling, two and three dimensional transformations, data structures, perspective views, antialiasing and software design. Prerequisites: Cmp Sc 228 and 253.
- 345 Introduction To Robotic Systems** (LEC 3.0) Analysis of methods of the design and operation of robotic systems. Identification of three-dimensional objects using digitized images. Arm control: coordinate transformations, feedback control systems, and hardware components. Applications of distributed micro-computers to robotic control. command languages and job assignments. Prerequisites: Math 22, Physics 24, (Cmp Sc 158 or Cmp Sc 228).
- 347 Introduction To Artificial Intelligence** (LEC 3.0) A modern introduction to AI, covering important topics of current interest such as search algorithms, heuristics, game trees, knowledge representation, reasoning, computational intelligence, and machine learning. Students will implement course concepts covering selected AI topics. Prerequisite: Cmp Sc 253.
- 354 Mathematical Logic I** (LEC 3.0) A mathematical introduction to logic with some applications. Functional and relational languages, satisfaction, soundness and completeness theorems, compactness theorems. Examples from Mathematics, Philosophy and/or Computer Science. Prerequisite: Philos 15 with junior standing or Math 305 or Comp Sci 253. (Co-listed with Math 354 and Philos 354)
- 355 Analysis Of Algorithms** (LEC 3.0) The purpose of this course is to teach the techniques needed to analyze algorithms. The focus of the presentation is on the practical application of these techniques to such as sorting, backtracking, and graph algorithms. Prerequisite: Cmp Sc 253.
- 360 Deterministic Modeling** (LEC 3.0) The course is an in-depth introduction to the basic building blocks of deterministic modeling using the digital computer. Topics include linear programming and nonlinear programming. Problem analysis and algorithm development and implementation will be covered. Programming project required. Prerequisites: Cmp Sc 228 or Math 203 or 208.
- 366 Regression Analysis** (LEC 3.0) Simple linear regression, multiple regression, regression diagnostics, multicollinearity, measures of influence and leverage, model selection techniques, polynomial models, regression with autocorrelated errors, introduction to non-linear regression. Prerequisites: Math 22 and one of Stat 211, 213, 215, 217, or 343. (Co-listed with Stat 346)
- 376 Operations Research Techniques For Managerial Decisions** (LEC 3.0) Introduction to forecasting techniques, linear programming, queuing theory and computer simulation. Application of the digital computer to the solution of problems in the above areas will be emphasized along with an understanding of the basic theoretical concepts. Offered EEC only. Prerequisite: Math 215 and programming competency. Not open to Cmp Sc majors with emphasis in O.R.
- 378 Introduction To Neural Networks & Applications** (LEC 3.0) Introduction to artificial neural network architectures, adaline, madaline, back propagation, BAM, and Hopfield memory, counterpropagation networks, self organizing maps, adaptive resonance theory, are the topics covered. Students experiment with the use of artificial neural networks in engineering through semester projects. Prerequisite: Math 229 or Math 204 or equivalent. (Co-listed with Sys Eng 378, El Eng 368)
- 381 The Structure Of Operating Systems** (LEC 3.0) The hardware and software requirements for operating systems for uniprogramming, multiprogramming, multiprocessing, time sharing, real time and virtual systems. The concepts of supervisors, interrupt handlers, input/output control systems, and memory mapping are discussed in detail. Prerequisite: Cmp Sc 284.
- 384 Distributed Operating Systems** (LEC 3.0) This is a study of modern operating systems, particularly distributed operating systems. Topics include a review of network systems and interprocess communication, causality, distributed state maintenance, failure detection, reconfiguration and recovery, load balancing, distributed file systems, distributed mutual exclusion, and stable property detection including deadlock detection. A group project in Distributed Systems programming will be required. Prerequisites: Cmp Sc 284 and 253.
- 385 Computer Communications And Networks** (LEC 3.0) Network architecture model including physical protocols for data transmission and error detection/correction, data link concepts, LAN protocols, internetworking, reliable end to end service, security, and application services. Students

will implement course concepts on an actual computer network. Prerequisites: Cmp Sc 284 and Cmp Sc 158.

- 387 Parallel Programming with MPI** (LEC 3.0) Parallel computer architectures, network topologies, parallel algorithms, pipelining, message passing, process scheduling and synchronization. Parallel programming with MPI on workstation clusters. Multithreaded programming. Speedup and efficiency issues. Prerequisites: Cmp Sc 284 and Cmp Sc 253.
- 390 Undergraduate Research** (IND 0.0-6.0) Designed for the undergraduate student who wishes to engage in research. Does not lead to the preparation of a thesis. Not more than six (6) credit hours allowed for graduation credit. Subject and credit to be arranged with the faculty supervisor.
- 397 Software Systems Development I** (LEC 3.0) Class members will work in small teams to develop a complete software system beginning with end-user interviews and concluding with end-user training. Prerequisites: Comp Sci 306 and 100 credit hours completed.
- 398 Software Systems Development II** (LEC 3.0) This course is an optional continuation of Cmp Sc 397. Those interested in project management should take this course since participants become officers or group leaders in the class "corporation." This course is especially important for those going straight into industry upon graduation. Students with coop experience may find this course redundant. Prerequisite: Cmp Sc 397.

## Education

If you are interested in teaching you may enter the Teacher Education Program. The purpose of the program is to satisfy the continuing need for well-qualified teachers in schools of Missouri and to provide a second career option for graduates.

You may earn a B.A. or B.S. Degree in your chosen certifiable field from UMR and a certificate to teach in the schools of Missouri. This program may be completed in four academic years, although you may elect to attend summer sessions if you wish to carry lighter course loads during the regular academic semesters. Student teaching is arranged with Rolla area public schools.

Majors in chemistry, physics or biological sciences with certification in the science area, history, economics and psychology with certification in social studies, English with certification in language arts, mathematics with certification in mathematics, may earn teaching certificates.

If you are enrolled in UMR's Schools of Engineering or Materials, Energy, and Earth Resources, you also have the opportunity for a second career by earning certification in mathematics or science through the Teacher Education Program. You should consult with the coordinator of the Teacher Education Program early in your academic career in order to plan curricula that will satisfy all requirements. You must have at least 22 ACT, 265 on

each part of the C-BASE, passing score on PRAXIS, and maintain at least a 2.5 GPA.

For updated information contact the coordinator of UMR Teacher Education Program and look on homepage <http://www.umar.edu/~tchreduc>

### Teacher Education Program

University of Missouri-Rolla is approved by the Missouri State Board of Education to offer professional education programs for purposes of professional certification. Admission to the University does not automatically qualify a student to participate in the professional component of the teacher education program. That participation is granted upon demonstration of a high level of academic and professional competence. Successful participation should result in the student's achieving certification to teach in Missouri Public Schools. Students who receive a certification recommendation must meet the standards for certification eligibility as outlined below:

- 1) Requirements for eligibility to enroll in professional education courses. Before a student may enroll in the advanced Professional courses eligibility requirements must have been met. The student must have:
  - A) A valid ACT score of a 22 on file in the education office as required by the Department of Elementary and Secondary Education.
  - B) Cumulative GPA of 2.5 or above.
  - C) Completed at least 30 semester hours.
- 2) **Requirements for Admission to/and continuance in the Teacher Education Program.** Students who plan to complete teacher certification requirements must be admitted to the Teacher Education Program. Application is automatically made when enrolling in EDU 40, 104, and 174. Admission to the program is required before students are allowed to begin additional courses in the professional education component.

The criteria used to determine admission or rejection to the Teacher Education program are outlined below. In addition to having completed at least 60 semester hours of university course work, the student must have:

- A) A combined (UMR and/or Transfer) GPA of 2.50 or above.
- B) Passes all sections of the Missouri State Board of Education Entry Examination with a CBASE score of 265 or higher on each section and attained a minimum grade of "C" or higher in Speech 85, Eng 20, 60, and Math College Algebra or above.
- C) Completed Educ 40 and 174 with a grade of "C" or higher.

A student's application for admission to the program is considered when the requirements listed above are completed.

- 3) **Requirements for Assignment to Student Teaching.** Successful completion of Student Teaching is a requirement for teacher certification. The criteria used to determine eligibility for Student Teaching are outlined below. The student must have:
  - A) Been admitted to the Teacher Education Program.



- B) Patrol and Child Abuse check are on file in the Teacher Education office with no record of a felony.
  - C) A combined GPA of 2.50 or above for all college level course work completed.
  - D) A combined GPA of 2.5 or above and have a “C” or above in professional classes.
  - E) A combined GPA of 2.5 or above in major, and have a “C” or above in each class.
  - F) Completed at least 15 hours at UMR, with a GPA of 2.50 or above for all work at UMR before placement in Student Teaching.
  - G) Been recommended by the student’s advisor. The recommendation shall be based upon the applicant’s character, personality, and potential for teaching.
  - H) Passed PRAXIS according to the Missouri Board of Education requirements.
  - I) A completed working portfolio that has met all the MO-Step indicators (approved by DESE) and has been approved by the education faculty and major advisor.
- 4) **Requirements for Certification Recommendation.** To be recommended for an initial Missouri teaching certification the student must have:
- A) Successfully completed Student Teaching.
  - B) Met all Missouri teacher certification requirements which are in effect at time of certification.
  - C) A cumulative combined (both UMR and transfer) GPA or 2.50 or higher.
  - D) Completed professional education courses with a GPA of 2.50 or higher (UMR and transfer combined) and no grade lower than a “C”.
  - E) A grade point average of 2.5 or higher (UMR and transfer combined) on a 4.0 scale in the certificate subject area of endorsement and no grade lower than “C”.
  - F) A working portfolio must be developed with all MO STEP indicators met and the portfolio must be approved by education faculty and discipline area advisor.
  - G) Fingerprinting completed during student teaching for certification.

## General Education Requirements

General education requirements are intended to provide you with the intellectual knowledge and skills for basic education. This body of knowledge and skills is arranged according to two broad categories: systems of symbolic thought and communication represented by linguistic and mathematical studies and systems of intellectual inquiry represented by basic academic disciplines. In addition, you must complete one course or unit in cultural diversity and the general education requirements can be fulfilled at the same time.

The following are generic requirements for all education students. However, any degree requirement not included in these general education requirements must be included in the professional requirements or subject matter requirements for each degree program.

## Symbolic Thought and Communications

- 1) **Linguistic Studies** (9 semester hours) You are required to take two courses in written communication and one course in oral communication. (You must have a grade of “C” or better in each course.)
- 2) **Mathematical Studies** (3 semester hours) The course must be college algebra or above.

## Systems of Intellectual Inquiry

- 1) **Humanities** At least one course each from two of the following areas required: art, music, philosophy, literature and theater.
- 2) **Natural Science** One course in biological sciences and one in physical science is required. One of these two courses must include a laboratory.
- 3) **Social and Behavioral Science** One course in each of the following areas is required: (1) American History, (2) American Government, and (3) General Psychology.

## Secondary Education Certification

In addition to the prescribed general educational courses, if you are preparing to become a secondary school teacher you must complete the following secondary professional education courses and the required courses of at least one teaching major.

You may major in English with English Certification (9-12); Economics, History or Psychology with Social Sciences Certification (9-12); Mathematics with Mathematics Certification (9-12); Biological Sciences, Chemistry or Physics with Certification (9-12).

You must meet UMR degree requirements and, in addition, course requirements for certification. (Those having a degree prior to certification must check with the education office for clarification of requirement procedures.)

The necessary course requirements and arrangements will be coordinated through the education office. Please pick up a sheet from the education office for your discipline area or print from [umr.edu/~tchreduc](http://umr.edu/~tchreduc)

## Elementary Education Certification

All courses are offered for elementary education that are required by the State Department of Education. It is imperative that you contact the coordinator of the education office for details prior to enrollment for Elementary Education courses. It would be a second area.

Dr. Evalee Lasater, [lasater@umr.edu](mailto:lasater@umr.edu), 573-341-4692.

## Middle School Endorsement

A student may have a second area of certification which is called an endorsement. The required courses with a first area of certification with a degree from University of Missouri-Rolla for middle school endorsement are Education 305, 335, 215 and 221 and English 311. The student must take Praxis II Middle School or PLT exam. If further questions, contact the Education office.

## Missouri State Board of Education Approved Programs

The following professional education programs have been approved by the Missouri State Board of Education for purposes of teacher preparation and certification. The approval date for the University for Missouri-Rolla is December 1998 through 2010. In the following areas:

- Elementary Education 1-6
- Secondary Education:
  - English 9-12
  - Mathematics 9-12
  - Social Science 9-12
  - Biology, Chemistry, Physics 9-12

Note: If changes occur at the State level, then those education requirements will supercede the catalog year and DOES NOT fall under the grandfather clause.

## Title II Report 2004-2005

The federal government this year required we report our Title II results for the 2004-2005 year. The report was submitted in April 2006. The University of Missouri-Rolla has a 100% passing rate on the PRAXIS for our completers. The state percent was 96%. A completer is one who has fulfilled all institutions guidelines to be recommended to the state for his/her teaching certificate. We have 100% of the completers teaching with 92% teaching in Missouri.

## Education Courses

- 40 Perspectives In Education** (LEC 2.0) This course is an introduction course which will assist students planning to enter the teacher-education program in assessing their personal and professional characteristics required for the teaching profession. It is an overview of the teacher education profession for elementary, middle and secondary.
- 100 Special Problems** (IND 0.0-6.0) Problems or readings on specific subjects or projects in the department. Consent of instructor required.
- 101 Special Topics** (Variable 0.0-6.0) This course is designed to give the department an opportunity to test a new course. Variable title.
- 102 Educational Psychology** (LEC 3.0) Principles of psychology relevant to the field of education. Concepts of human growth and development; the learning process, with special emphasis on abilities and teaching-learning processes; measurement and evaluation of school learning; mental health in the classroom. Observation of children will be included. Prerequisite: Psych 50. (Co-listed with Psych 155)
- 104 Teacher Field Experience** (LAB 2.0) Observation and analysis of instructional techniques and duties in the classroom and school environment by discipline. Student will spend at least 30 contact hours per credit hours in classroom. In addition, library and field experience reports will be made. In addition, Action Research and Seminars will be required. Prerequisite: Educ 40.
- 164 Aiding Elementary, Middle And Secondary Schools** (LAB 2.0) Instructionally-related clinical/administrative and monitorial duties in the classroom during semesters and summer. Student works 30 hours for each credit, with instructor supervising. Also, Action Research and Seminars are required. Prerequisites: Educ 40 and 104.
- 174 School Organization & Adm For Elementary & Secondary Teachers** (LEC 2.0) Required for certification of elementary and secondary teachers. Course content relates to methods of organization and management in the elementary and secondary schools. Prerequisites: Educ 40 and 104.
- 200 Special Problems** (IND 0.0-6.0) Problems or readings on specific subjects or projects in the department. Consent of instructor required.
- 201 Special Topics** (Variable 0.0-6.0) This course is designed to give the department an opportunity to test a new course. Variable title.
- 202 Problems Of Teaching Social Studies** (LEC 2.0) A study of current methodologies for teaching in area of specialization.
- 203 Problems Of Teaching Mathematics** (LEC 2.0) A study of current methodologies for teaching in area of specialization.
- 205 Problems Of Teaching Science/Chemistry** (LEC 2.0) A study of current methodologies for teaching in area of specialization.
- 206 Problems Of Teaching Science/Physics** (LEC 2.0) A study of current methodologies for teaching in area of specialization.
- 207 Problems Of Teaching English** (LEC 2.0) A study of current methodologies for teaching in area of specialization.
- 208 Psychological & Educational Development Of The Adolescent** (LEC 3.0) A theoretical and empirical examination of the psychological and educational development of the adolescent.
- 211 Child Psychology** (LEC 3.0) The psychological, intellectual, social, and physical development of children with emphasis on the cognitive and affective processes. The theory, research and application will be studied. Prerequisite: Educ 40 or Psych 50.
- 212 Children'S Literature** (LEC 3.0) Introduction to the study and teaching of children's literature. Emphasis on historical developments, multi-cultural issues and works. Computer intensive. Prerequisites: English 20 and one semester of college literature. (Co-listed with English 212)
- 215 Teaching Of Reading In Elementary And Middle School** (LEC 3.0) Current materials, methods and teaching techniques in teaching reading in elementary and middle school grades. Emphasis on assessing elementary and middle students needs, individualizing programs based on needs, reading in the content areas, study skills and recreational reading as a lifetime habit. Prerequisite: Educ 40.

- 216 Teaching Reading In Content Area** (LEC 3.0) For elementary, middle and secondary school teachers. Specific ways teachers can help students improve reading skills in content areas and ways reading can be taught in reading classes.
- 217 Analysis And Correction Of Reading Difficulties** (LEC 3.0) Procedures for diagnosing and correcting reading problems within the classroom. Acquaint preservice teachers preparing for elementary with commercial prepared informal diagnostic instruments, attitude and interest inventories, prescriptive measures, anecdotal records and strategies for corrective reading instruction within the regular classroom for elementary children. Prerequisite: Educ 215.
- 218 Language Arts For Elementary Teachers** (LEC 3.0) Procedures used in teaching integrated language arts in elementary grades. The strategies would be the development of written and oral communication for use in elementary grades. Prerequisite: Educ 40.
- 219 Art For Elementary Teachers** (LEC 3.0) Considers the vital role of art activities and creative experiences in the growth and development of children at their level. Prerequisite: Educ 40. (Co-listed with Art 219)
- 221 Teaching Math In Elementary And Middle Schools** (LEC 3.0) The course presents an overview of how children learn mathematics, various techniques in teaching mathematics, and examples of applying these techniques to specific mathematical concepts (such as geometry, measurement, basic operations, statistics and probability, etc.). Prerequisite: Educ 40 or Math 2 or 4. (Co-listed with Math 221)
- 222 Geometric Concepts For Elementary Teachers** (LEC 3.0) The course covers methods of teaching the study of points, lines, polygons, similarity, congruence, constructions, and proof in Euclidean Plane Geometry. Transformational geometry and trigonometry are introduced to elementary teachers. Prerequisite: Educ 40 or Math 2 or 4. (Co-listed with Math 222)
- 230 Methods In Physical Education K-4** (LEC 3.0) The course will provide the opportunity to learn how to promote student fitness and skill development while building the foundation for a physically active life through specific activities aimed at the younger child. (Co-listed with Phy Ed 230)
- 231 Methods In Physical Education 5-9** (LEC 3.0) The course will provide the opportunity to learn how to promote student fitness and skill development while building the foundation for a physically active life through specific activities aimed at the student in transition from childhood to young adulthood (5-9). (Co-listed with Phy Ed 231)
- 251 Historical Foundation Of American Education** (LEC 3.0) Development of American educational institutions and ideas, and of social forces that have influenced them. Prerequisites: Educ 40 and Hist 175 or 176.
- 280 Teaching Methods And Skills In The Content Areas** (LEC 6.0) Series of weekly experiences, demonstrations, observations, micro teaching, small group discussions to develop concepts of and skills in a variety of basic teaching tasks. Also, demonstration and lecture exercises in the preparation and use of audio visual materials for teaching. Prerequisites: Educ 40 and 104.
- 298 Student Teaching Seminar** (LEC 1.0) Weekly seminars will be required for all students enrolled in student teaching. Contemporary educational topics, trends, reflective decision making and other pertinent topics will be covered. Reflection of topics and experiences will be exhibited in papers, portfolios and journal writings. Prerequisites: Meet all requirements for student teaching and concurrently be enrolled in student teaching.
- 299 Student Teaching** (LEC 12.0) Student teaching will be supervised participation, on the level of certification in an assigned Public School. Student teaching is based on 16 weeks (8 weeks in two schools and requires the student teacher to demonstrate his/her ability to be effective decision making teacher and an inquiry learner. Prerequisites: Professional standing and arrangements made previous semester.
- 300 Special Problems** (IND 0.0-6.0) Problems or readings on specific subjects or projects in the department. Consent of instructor required.
- 301 Special Topics** (Variable 0.0-6.0) This course is designed to give the department an opportunity to test a new course. Variable title.
- 305 Philosophy And Administration Of The Middle School** (LEC 3.0) This course will acquaint students with aspects of education that are unique to the middle school. Attention will be given to the philosophy underlying the middle school. Finally, leadership theories most appropriate to the middle school will be studied.
- 315 Advanced Adolescent Development** (LEC 3.0) This course is an advanced examination of the intellectual and social development of the adolescent. Theories of adolescent development and their implications for the educative process are covered and debated.
- 320 Professional Development** (LEC 1.0) This online course focuses on the responsibilities of the professional development committee, state requirements, and components of effective programs that positively impact student performance. Students will examine the relationships among the district's Comprehensive School Improvement Plan, MSIP and the PD Plan. Prerequisite: Graduate standing.
- 325 Novell Netware 4.1 / 4.11** (LEC 3.0) A practical, hands-on course for Novell network administration including NDS planning, mapping and documentation; system power up/down; security, resource service management; user management from creation to user and workstation maintenance; application software installation and management, and Novell Server installation.

- 335 Curriculum And Instruction Of The Middle School** (LEC 3.0) This course advances teachers' understanding of middle school curriculum and instruction. It utilizes knowledge about the nature and needs of young adolescents in developing interdisciplinary learning units, and fosters applications appropriate to experienced teachers' professional assignments. Prerequisite: Graduate standing.
- 339 Current Issues In Educ: Performance Based Assessment, Beginning** (LEC 1.0 and LAB 2.0) This course is intended to provide an understanding of the principles of sound classroom assessment, the five different types of learning outcomes that need to be assessed and the choice of an assessment that best evaluates the achievement targets. Prerequisite: Practicing educator.
- 340 Current Issues In Educ: Performance Based Assessment, Intermediate** (LEC 3.0) This course will provide participants with an understanding of performance-based assessments, how to construct performance tasks and how to construct scoring guides.
- 341 Current Issues In Educ: Performance Based Assessment, Advanced** (LEC 1.0 and LAB 2.0) This course is intended to provide an understanding of balanced classroom assessment. Students will learn to create multiple types of assessment measures for the purpose of evaluating a wide variety of achievement targets. Prerequisite: Practicing educator.
- 345 Introducing Educators To Computers** (LEC 1.0) A basic introduction to computers for K-12 educators. Includes identification and use of hardware components, as well as the fundamentals of using the operating system and basic computer software. Actual software taught will reflect current usage. Prerequisite: Post Bac/practicing teacher.
- 350 Social Studies In The Elementary School** (LEC 3.0) Problems in preparation, teaching of social studies units with suitable materials, techniques for elementary teachers. Prerequisite: Instructor's approval.
- 354 Psychology Of The Exceptional Child** (LEC 3.0) An understanding of the abilities and disabilities of children classified as exceptional, the instructional organization utilized to meet the needs of the exceptional child in the classroom, the import of educational and psychological handicaps upon these children. Guest lectures and field trips. Prerequisite: Psych 50. (Co-listed with Psych 354)
- 360 Teaching For Responsible Behavior** (LEC 3.0) A valuing approach to drug abuse and other high risk behaviors. A study of specific methods, strategies, and techniques to help students from kindergarten to twelfth grade to develop value-sharing attitudes and decision-making skills, based on sound information, which will inhibit their involvement in such high risk behaviors as drug abuse. Prerequisite: Senior standing.

## English

### Bachelor of Arts in English Master of Arts in English

**Master of Arts available as a cooperative degree program with the English Department of the University of Missouri-St. Louis. A maximum of 12 graduate semester hours may be taken at UMR.**

The English program is offered in the Department of English and Technical Communication.

The English curriculum involves the study of language, literature, and culture. Topics include literary history, criticism, literary forms, and detailed examinations of individual authors. Additional genre and theme courses are available, including world literature, literature and film, and literature by women. Linguistics and writing courses include the history and structure of the English language, advanced composition, and desktop publishing.

If you plan to become a secondary school teacher of English-language arts, UMR offers a teacher certification program.

Five minors in English also are available. These minors consist of approved course work in American studies, literature, writing, technical communication, and literature and film. You can major in any other academic field and minor in these areas.

In addition to taking the courses in the English curriculum, English majors and minors, will have the opportunity to join the writing staffs of campus publications to contribute work to a creative magazine (Southwinds), to participate in Sigma Tau Delta and to attend lectures given by visiting scholars and writers.

### Faculty

#### Associate Professors:

Anne Cotterill, Ph.D., Washington University  
Gene Doty, M.A., Emporia State University  
Kristine Swenson, Ph.D., University of Iowa

#### Assistant Professors:

Kate Drowne, Ph.D., University of North Carolina-Chapel Hill  
Ed Malone, Ph.D., Southern Illinois University at Carbondale  
Kathryn Northcut, Ph.D., Texas Tech University  
Trent Watts, Ph.D., University of Chicago

#### Instructors:

John Morgan, M.A., Kansas

#### Emeritus Faculty:

Elizabeth Cummins, (Emeritus) Ph.D., University of Illinois  
Nicholas Knight, (Emeritus), Ph.D., University of Indiana  
Michael Patrick (Emeritus), Ph.D., University of Missouri-Columbia  
Marilyn Pogue (Emeritus), Ph.D., University of Missouri-Columbia  
Jean Walker (Emeritus), Ph.D., University of Texas  
James Wise (Emeritus), Ph.D., University of Florida

Douglas Wixson (Emeritus), Ph.D., University of North Carolina

## Bachelor of Arts English

The requirements for the English major are as follows:

- 1) Prerequisites for the English major are English 75, 80, 105, and 106. Six of these hours will satisfy the General Education Humanities requirements for the Bachelor of Arts degree.
- 2) Twenty-four hours of English course work at the 200 and 300 level, including English 202, "Critical Approaches to Literature," and English 350, "Texts and Contexts."

Of these twenty-four hours a minimum of fifteen hours must be at the 300 level. Only nine hours at the 200 level may count towards fulfilling the major requirements.

Students are strongly recommended to work closely with their advisors in planning their major curriculum.

## Bachelor of Arts (Preparation for Teacher Certification)

The student will fulfill the general requirements for the Bachelor of Arts degree, *except for foreign language; and a minor*, the requirements for the English major, (*teacher certification*); and the requirements for Missouri certification in the teaching of English. See Education. Contact the UMR English Department for advising. Students preparing for Teacher Certification note the requirements for the English major are as follows:

- 1) English 75, 80, 105, 106.
- 2) Fifteen hours of course work at the 200 or 300 level in English and American literature, including two courses in English Literature; and two American Literature courses, including literature for adolescents.
- 3) Six hours of linguistics.
- 4) English 202, Critical Approaches to Literature.
- 5) Capstone course for major: English 350.
- 6) Twelve hours of writing, including a course in the teaching of writing. Six of these hours will also be satisfied by the General Education Composition requirement for the B.A. degree; three of these hours will also be satisfied by the capstone course.
- 7) A minimum of fifteen hours must be at the 300 level.

## English Minor Curriculum

English offers five minors:

- 1) **Literature.** To complete this minor, students must take 12 hours of Literature courses offered by the English Department; at least 9 hours of these must be at the 200 or 300 level.
- 2) **Writing.** To complete this minor, students must take English 281, Theory of Written Communication, plus 9 hours selected from the following courses: English 60, 65, 70, 160, 260, 302, 305, or 306.
- 3) **Literature and Film.** The minor requires 12 hours, including the following required courses: Art 85: Study of Film (3) and the core course, English 177;

Literature and Film (3). In addition, students will take 6 hours of electives in the field of literature and film studies. These electives can include but are not limited to Art 255: Script to Screen (3); English 278; Thematic Studies in Literature and Film (3); English 279: Genre Studies in Literature and Film; Art 250: Thematic Studies in Film and Literature (3); and Art 251: Genre Studies in Film and Literature (3).

- 4) **American Studies.** The minor requires 15 hours, including English 178, Introduction to American Studies and English 378, The American Experience. In addition, the student, in consultation with the minor advisor, will select three courses, one of which must be at the 300 level, from the areas of American art, history, literature, music, or philosophy.
- 5) **Technical Communication.** To complete this minor students must take Technical Communication 65, 240, and 260 plus six additional hours elected from the 300 level technical communication courses.

All students who minor in English must have a minor advisor in the English Department, must complete a minor form, and must file it with the English Department. (English 20 Exposition and Argumentation cannot be counted toward an English minor.)

## English Courses

- 1) **IEP Basic ESL Skills** (LEC 0.0) Focuses on basic reading comprehension with basic vocabulary development, and on listening comprehension. The primary focus of this course is on the development of functional proficiency. For non-native speakers of English. Prerequisites: By placement examinations in ALI; accepted student to UMR. The IEP Program will assess fees for this course.
- 2) **IEP Grammar Through Writing** (LEC 0.0) Presents basic English grammar to promote a beginning-level understanding of the structure and workings of the English language. Introduces basic writing applications. For nonnative speakers of English. Prerequisites: By placement examinations in ALI; accepted student to UMR. The IEP Program will assess fees for this course.
- 3) **IEP Core ESL Skills** (LEC 0.0) Focuses on reading comprehension including vocabulary development, and on listening comprehension through basic academic applications. For non-native speakers of English. Prerequisites: By placement examinations in ALI; accepted student to UMR. The IEP Program will assess fees for this course.
- 4) **IEP Writing & Grammar** (LEC 0.0) Introduces more complex writing applications, focusing on basic academic requirements. Focuses on more complex aspects of English grammar. For non-native speakers of English. Prerequisites: By placement examinations in ALI; accepted student to UMR. The IEP Program will assess fees for this course.
- 5) **IEP Academic ESL Skills** (LEC 0.0) Focuses on reading comprehension using academic reading materials, on development of academic vocabulary, and on listening comprehension using aca-

- demic-level lectures. For non-native speakers of English. Prerequisites: By placement examinations in ALI; accepted student to UMR. The IEP Program will assess fees for this course.
- 6 **IEP ESL Writing Workshop** (LEC 0.0) Focuses on developing academic writing applications. For nonnative speakers of English. Prerequisites: By placement examinations in ALI; accepted student to UMR. The IEP Program will assess fees for this course.
- 7 **IEP American English Articulation** (LEC 0.0) Students who need specific instruction and practice in pronunciation receive heavy drills and activities to improve their articulation of American English. For non-native speakers of English. Prerequisites: By approval; accepted student to UMR. The IEP Program will assess fees for this course.
- 8 **IEP ESL Conversation, Discussion, Presentation** (LEC 0.0) Students who need intense practice in verbal activities participate in numerous varied activities to further develop their verbal skills. For non-native speakers of English. Prerequisites: By approval; accepted student to UMR. The IEP Program will assess fees for this course.
- 10 **English As A Second Language-I** (IND 0.0-6.0) Elementary English for non-English speakers. Conversation and reading. A study of English recommended for international students during their first semester in the United States.
- 11 **English As A Second Language-II** (LEC 3.0) Elementary English II for non-English speakers. A course concurrent with or subsequent to ESL I, designed to provide more intensive instruction in conversation and reading for international students.
- 20 **Exposition And Argumentation** (LEC 3.0) Practice in college level essay writing.
- 60 **Writing And Research** (LEC 3.0) Practice in techniques of analytical writing and in methods of research. Prerequisite: English 20.
- 65 **The Technical Writer In Business and Industry** (LEC 3.0) Introduction to the role of the professional technical communicator in business and industry and practice in methods of developing technical documents. Prerequisite: English 20. (Co-listed with TCH COM 65)
- 70 **Creative Writing** (LEC 3.0) Practice in forms and techniques of poetry and prose fiction, with special attention to narrative development. Prerequisite: English 20.
- 75 **British Literature I: The Beginnings To 1800** (LEC 3.0) A survey of works and authors that explores the way these works represent the chronological period and express the individual concerns and techniques of those authors.
- 80 **British Literature II 1800 To Present** (LEC 3.0) A survey of works and authors that explores the way these works represent the chronological period and express the individual concerns and techniques of those authors.
- 100 **Special Problems And Readings** (IND 0.0-6.0) Problems or readings on specific subjects or projects in the department. Consent of instructor required.
- 101 **Special Topics** (Variable 0.0-6.0) This course is designed to give the department an opportunity to test a new course. Variable title.
- 102 **World Literature I: From The Beginnings To The Renaissance** (LEC 3.0) A survey of representative works and authors from the world's cultures. (Excludes British and American works).
- 105 **American Literature: 1600 To 1865** (LEC 3.0) A chronological survey that explores the ways the literature represents the concerns of individual authors as well as the history of literature.
- 106 **American Literature: 1865 To Present** (LEC 3.0) A chronological survey that explores the ways the literature represents the concerns of individual authors as well as the history of literature.
- 160 **Technical Writing** (LEC 3.0) The theory and practice of writing technical papers and reports in the professions. Prerequisites: English 20 and second-semester junior standing.
- 177 **Literature And Film** (LEC 3.0) This course will examine intertextual connections between literature and film, in terms of such things as adaptations, narrative technique and theory, genre, theme, and ideological movements. Prerequisite: English 20.
- 178 **Introduction To American Studies** (LEC 3.0) Introduces the core subjects as well as the methods and theories that constitute the field of American Studies.
- 200 **Special Problems And Readings** (IND 0.0-6.0) Problems or readings on specific subjects or projects in the department. Consent of instructor required.
- 201 **Special Topics** (Variable 0.0-6.0) This course is designed to give the department an opportunity to test a new course. Variable title.
- 202 **Critical Approaches To Literature** (LEC 3.0) Study and application of the terminology and critical approaches used in understanding literary forms and genres.
- 210 **Seminar** (IND 0.0-6.0) Discussion of current topics. Prerequisites: English 20 and a semester of college literature.
- 212 **Children'S Literature** (LEC 3.0) Introduction to the study and teaching of children's literature. Emphasis on historical developments, multi-cultural issues and works. Computer intensive. Prerequisites: English 20 and one semester of college literature. (Co-listed with Education 212)
- 213 **Literature For Adolescents** (LEC 3.0) Primarily intended for teacher certification students. Selection and organization of materials for teaching literature to adolescents. Emphasizes literature written for adolescents and includes a unit of literature of American ethnic groups. Prerequisites: English 20 and a semester of college literature.
- 215 **Literature By Women** (LEC 3.0) A study of writings by women, emphasizing major writers and the development of a female literary tradition.

- Prerequisites: English 20 and a semester of college literature.
- 225 Science Fiction And Fantasy Literature** (LEC 3.0) A study of short stories, poems, or novels which represent the development and the techniques of the science fiction-fantasy genre. Prerequisites: English 20 and a semester of college literature.
- 227 Fantasy Literature** (LEC 3.0) A study of the development of fantasy literature in the nineteenth and twentieth centuries. The primary focus will be on novels, especially the work of J.R.R. Tolkien. Prerequisites: English 20 and a semester of college literature.
- 230 Black American Literature** (LEC 3.0) The history and development of black literature in America, with special emphasis upon contemporary achievements. Prerequisites: English 20 and a semester of college literature.
- 240 Layout And Design** (LEC 3.0) Theory and practice of layout and design for print and electronic media. Prerequisite: English 65 or TCH COM 65.
- 245 American Crime And Detective Fiction** (LEC 3.0) An introduction survey of American crime literature emphasizing the works of Hammett, Chandler, and James M. Cain to the more recent "true crime" tradition beginning with Capote's *In Cold Blood*. Prerequisites: English 20 and a semester of college literature.
- 260 Practicum in Technical Communication** (LEC 3.0) Practice in writing, editing, and designing layouts of technical publications using the personal computer for desktop publication. Prerequisites: English 65 and English 240, or TCH COM 65 and TCH COM 240. (Co-listed with TCH COM 260)
- 278 Thematic Studies In Literature And Film** (LEC 3.0) Topics examine different thematic relationships between literature and film (e.g. Poe and Hitchcock, Shakespeare on film, etc.) announced at time of registration. Prerequisites: English 20 and semester of college literature, or English 177.
- 281 Theory Of Written Communication** (LEC 3.0) Major critical and conceptual approaches to written communication theory; includes semantics, history of print media, visible language, grammars, discourse theory, socio-linguistics reception theory, stylistics. Prerequisites: English 20 and a semester of college literature.
- 300 Special Problems** (IND 0.0-6.0) Problems or readings on specific subjects or projects in the department. Consent of instructor required.
- 301 Special Topics** (Variable 0.0-6.0) This course is designed to give the department an opportunity to test a new course. Variable title.
- 302 Advanced Composition** (LEC 3.0) Instruction and practice in writing expository essays of substantial content and skill, with particular emphasis on the rhetorical applications of recent findings in language research. Papers required will include critical analyses of literary works, and library research. Prerequisite: English 60 or 160.
- 303 Internship** (LEC 0.0-6.0) Internship will involve students applying critical thinking skills and discipline specific knowledge in a work setting based on a project designed by the advisor and employee. Activities will vary depending on the student's background and the setting. Prerequisite: Senior status; must have completed 24 hours in the major.
- 305 History And Structure Of The English Language** (LEC 3.0) An introduction to the study of the English language and its history through Old English, Middle English, and Modern English. Prerequisite: English 20.
- 306 A Linguistic Study Of Modern English** (LEC 3.0) A descriptive analysis of Modern English--its phonology, grammar, and vocabulary. Prerequisite: English 20.
- 310 Seminar** (RSD 3.0) Discussion of current topics. Prerequisites: English 20 and a semester of college literature.
- 311 Teaching And Supervising Writing** (LEC 3.0) Students will study contemporary and traditional approaches to writing instruction. The course will give students practice in applying composition theory and research to development of teaching methods, including course syllabi and assignments. Prerequisite: 6 hours of college level writing courses.
- 312 Survey Of Old And Middle English Literature** (LEC 3.0) Survey of Old English poetry in translation and Middle English literature (excluding Chaucer) through Malory. Special emphasis on culture and language with some attention given to modern reinterpretation of medieval works. Prerequisites: English 20 and a semester of college literature.
- 315 Chaucer** (LEC 3.0) A study of Chaucer as a narrative poet by an intensive examination of *The Canterbury Tales* and *Troilus and Criseyde*. Prerequisites: English 20 and a semester of college literature.
- 330 Sixteenth Century English Literature** (LEC 3.0) A survey of the poetry and prose of England from 1500 to 1600. Prerequisites: English 20 and a semester of college literature.
- 331 Seventeenth Century English Literature** (LEC 3.0) A study of major authors (excluding Milton) of prose and poetry in England from 1600 to 1660. Special attention will be paid to John Donne and the metaphysical poets, to Ben Jonson and the Cavalier poets, and to major prose writers such as Francis Bacon, Sir Thomas Browne, and others. Prerequisites: English 20 and a semester of college literature.
- 337 The Plays Of William Shakespeare** (LEC 3.0) Selected comedies, tragedies, histories, and romances from early middle, and late periods of William Shakespeare's life. Prerequisites: English 20 and a semester of college literature.
- 345 The Restoration & Eighteenth Century** (LEC 3.0) The history, development, and cultural contexts of British literature from 1660 to 1798. Pre-

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- requisites: English 20 and a semester of college literature.
- 350 Texts And Contexts** (LEC 3.0) Examines the relationships between selected texts written or published in a given year and the context of events of that time. Also explores current critical approaches to such texts and contexts. Writing intensive and Computer intensive. Prerequisites: English 20 and a semester of college literature; junior standing.
- 353 British Romantic Literature** (LEC 3.0) A study of the prose and poetry of the British Romantic period, 1775 to 1832. Prerequisite: English 20 and a semester of college literature.
- 355 Victorian Literature** (LEC 3.0) A study of British prose and poetry from 1832 to 1900. Prerequisites: English 20 and a semester of college literature.
- 361 The British Novel I** (LEC 3.0) The history, development, and cultural contexts of the British novel from the late seventeenth to the early nineteenth century. Prerequisite: English 20 and a semester college literature.
- 362 The English Novel II** (LEC 3.0) A study of the development of the novel with major attention given to the Victorian and 20th century novelists. Prerequisites: English 20 and a semester of college literature.
- 368 Early American Literature** (LEC 3.0) This course will follow the development of American literature from its Colonial beginnings (1614) to the rise of Romanticism (1836). The course will pay particular attention to how American writers used literature in defining and even creating the New World. Prerequisites: English 20 and a semester of college literature.
- 370 American Poetry I** (LEC 3.0) A study of significant selected poets of, primarily, the 19th century, with special attention to theme, diction, and form, and to poetry as a compressed image of the human condition. Prerequisites: English 20 and a semester of college literature.
- 371 The American Renaissance** (LEC 3.0) A study of American literature from Poe to Whitman. Prerequisites: English 20 and a semester of college literature.
- 372 American Poetry II** (LEC 3.0) A study of significant selected poets of the 20th century, with special attention to theme, diction, and form, and poetry as a compressed image of the human condition. Prerequisites: English 20 and a semester of college literature.
- 375 The American Novel I** (LEC 3.0) A study of selected, representative novels in chronological sequence from the beginning to the major realists. Prerequisites: English 20 and a semester of college literature.
- 376 The American Novel II** (LEC 3.0) A study of selected, representative novels in chronological sequence from the major realists to the present. Prerequisites: English 20 and a semester of college literature.
- 378 The American Experience** (LEC 3.0) Examines one or more of the subjects of the American experience such as race, gender, class, ethnicity, region, technology, religion, as it is expressed in the culture. Prerequisite: English 178.
- 379 Mark Twain** (LEC 3.0) A study of Mark Twain's works which may include such topics as Twain's contribution to American humor and American prose style. Prerequisites: English 20 and a semester of college literature.
- 380 Contemporary American Literature** (LEC 3.0) Studies in American prose (fiction and non-fiction), drama, poetry, and screen plays published within the last fifteen years. Prerequisites: English 20 and a semester of college literature.
- 382 Contemporary British Literature** (LEC 3.0) Studies in British prose (fiction and non-fiction), drama, poetry, and screen plays published within the last fifteen years. Prerequisites: English 20 and a semester of college literature.
- 390 Undergraduate Research** (IND 0.0-6.0) Designed for the undergraduate student who wishes to engage in research. Not for graduate credit. Not more than six (6) credit hours allowed for graduation credit. Subject and credit to be arranged with the instructor. Consent of instructor required.
- 392 Advanced Writing For Science & Engineering** (LEC 3.0) Focus on writing applications specifically for students in scientific or engineering fields. Primary emphases will be on producing effective and readable professional writing. Prerequisites: English 160 and 260, or graduate standing.
- 393 Advanced Writing For Science And Engineering II** (LEC 2.0) This course -- second in a series -- focuses on writing for publication, from the initial proposal and query to the final product. Students will work on the materials they have underway with their advisers and/or research colleagues. Prerequisites: English 160 and 260, or graduate standing.

## Etymology

### Etymology Courses

- 200 Special Problems** (IND 0.0-6.0) Problems or readings on specific subjects or projects in the department. Prerequisite: Consent of instructor.
- 306 Introduction To Etymology** (LEC 3.0) Introduction to etymology in its broadest sense: origin of words, idioms, writing systems, etc. Prerequisite: Any foreign language course or English 20.

## Foreign Languages

### (French, German, Russian, Spanish)

UMR offers courses in Spanish, German, Russian, and French. Previous training is not required for language study at UMR.



After two semesters of foreign language study on campus, you should be able to converse on an elementary level. You will be introduced to foreign literature in the second or third semester.

A minor in French, German, Russian or Spanish is available. You may fulfill your B.A. language requirement from any of the four foreign languages offered.

## Faculty

### Professor:

Gerald Cohen, Ph.D., Columbia University

### Lecturers:

Regina Young, Ph.D., Washington University

### Instructors:

Irina Ivliyeva, Ph.D., Moscow University

## Minor in Foreign Languages

A foreign language minor will consist of nine hours of course work, chosen or selected in consultation with a faculty advisor, beyond the language requirement for the B.A. degree.

The additional nine hours must include one course of masterpieces and two courses on the 300 level in that foreign language.

# French

## French Courses

- 1 **Elementary French I** (LEC 4.0) Introduction to reading, conversation, and grammar. Laboratory optional. Prerequisite: Entrance requirements.
- 2 **Elementary French II** (LEC 4.0) A continuation of French 1. Prerequisite: French 1.
- 80 **French Readings And Composition** (LEC 4.0) Readings in French narrative literature and composition. Prerequisite: French 2.
- 90 **Scientific French** (LEC 3.0) A study of representative writing in the sciences and technology. Emphasis on scientific literature in the student's major field. Prerequisite: French 2.
- 100 **Special Problems** (IND 0.0-6.0) Problems or readings on specific subjects or projects in the department. Consent of instructor required.
- 101 **Special Topics** (Variable 0.0-6.0) This course is designed to give the department an opportunity to test a new course. Variable title.
- 110 **Basic French Conversation** (LEC 2.0) French conversation and oral practice. Prerequisite: French 2.
- 170 **Masterpieces Of French Literature** (LEC 3.0) Selected major works and movements in French literature. Prerequisite: French 80.
- 180 **Basic French Composition** (LEC 3.0) Composition and translations from English. Prerequisite: French 2.
- 200 **Special Problems** (IND 0.0-6.0) Problems or readings on specific subjects or projects in the department. Consent of instructor required.
- 201 **Special Topics** (Variable 0.0-6.0) This course is designed to give the department an opportunity to test a new course. Variable title.
- 300 **Special Problems** (IND 0.0-6.0) Problems or readings on specific subjects or projects in the department. Consent of instructor required.
- 301 **Special Topics** (Variable 0.0-6.0) This course is designed to give the department an opportunity to test a new course. Variable title.
- 310 **Seminar** (IND 0.0-6.0) Discussion of current topics. Prerequisite: Senior standing.
- 311 **Advanced French Conversation** (LEC 2.0) Advanced conversation and oral practice. Prerequisite: French 110.
- 360 **French Culture And Civilization** (LEC 3.0) A survey of French culture and civilization of the past 2,000 years, including art, architecture, music, literature, geography and politics. Prerequisite: French 170.
- 370 **Survey Of French Literature I (Early Period)** (LEC 3.0) The history and development of French literature from Les Chansons De Geste through the important philosophers of the 18th century to Beaumarchais. Assigned readings are in French, and lectures are largely in French. Prerequisite: French 170.
- 375 **Survey Of French Literature II (Modern Period)** (LEC 3.0) 19th and 20th century French literature. Prerequisite: French 170.
- 378 **French Theater** (LEC 3.0) A study of French theater including in-depth study of selected plays by, for example, Moliere, Hugo, Giraudoux, and Ionesco. Prerequisite: (One survey class) French 370 or 375.

# German

## German Courses

- 1 **Elementary German I** (LEC 4.0) Introduction to grammar, reading, and conversation. Laboratory required. (One extra hour per week.) Prerequisite: Entrance requirements.
- 2 **Elementary German II** (LEC 4.0) A continuation of German 1. Prerequisite: German 1.
- 70 **Classical And Modern German Readings** (LEC 4.0) Readings in German narrative literature. Prerequisite: German 2.
- 90 **Scientific German** (LEC 3.0) A study of a representative writing in the sciences and technology. Emphasis on scientific literature in the student's major field. Prerequisite: German 2.
- 100 **Special Problems** (IND 0.0-6.0) Problems or readings on specific subjects or projects in the department. Consent of instructor required.
- 101 **Special Topics** (Variable 0.0-6.0) This course is designed to give the department an opportunity to test a new course. Variable title.
- 110 **Basic German Conversation** (LEC 2.0) Conversation and oral practice. Prerequisite: German 2.
- 170 **Masterpieces Of German Literature** (LEC 3.0) A study of selected major works and movements in German literature. Prerequisite: German 70.

- 180 **Basic German Composition** (LEC 3.0) Elementary composition: compositions and written translations. Prerequisite: German 2.
- 200 **Special Problems** (IND 0.0-6.0) Problems or readings on specific subjects or projects in the department. Consent of instructor required.
- 201 **Special Topics** (Variable 0.0-6.0) This course is designed to give the department an opportunity to test a new course. Variable title.
- 300 **Special Problems** (IND 0.0-6.0) Problems or readings on specific subjects or projects in the department. Consent of instructor required.
- 301 **Special Topics** (Variable 0.0-6.0) This course is designed to give the department an opportunity to test a new course. Variable title.
- 310 **Seminar** (IND 0.0-6.0) Discussion of current topics. Prerequisite: Senior standing.
- 311 **Advanced German Conversation** (LEC 2.0) Advanced conversation and oral practice. Prerequisite: German 110.
- 370 **Survey Of German Literature I** (Early Period) (LEC 3.0) A study of the history and development of 16th, 17th, and 18th century German literature. Fall semester. Prerequisite: German 170.
- 375 **Survey Of German Literature II** (Modern Period) (LEC 3.0) 19th and 20th century German literature. Prerequisite: German 170.
- 385 **The German Novelle** (LEC 3.0) A study of the German novelle as a literary genre. Prerequisite: German 170.

# History

## Bachelor of Arts/History Master of Arts

Master of Arts available as a cooperative degree program with the History Department of the University of Missouri-St. Louis. A maximum of 12 graduate semester hours may be taken at UMR.

History is a response to the eternal desire of human beings to know more about themselves. For this reason, history students experience a variety of courses, which emphasize the importance of people, their individual choices, their values and their ways of seeing themselves and their world. History majors study man's accumulated heritage from the fossil past to the nuclear present.

This varied course of study includes fundamental survey classes, specific chronological or topical investigations, and special topic seminars. At UMR individuals who hold Ph.D. degrees and are publishing scholars teach virtually all of your history and political science courses. The hallmark of the program is individual attention. In upper-level courses, efforts are made to keep class sizes small enough to enable discussion, which in turn provides for a greater breadth of knowledge and depth of understanding, and for personal student-professor associations.

As a history major you learn to analyze information, communicate effectively, and engage in research. Such skills are useful for careers in government service, busi-

ness, industry, and social service institutions, as well as being the fundamental requisites for graduate and professional studies beyond the undergraduate degree.

If you plan to become a secondary school history teacher, you can fulfill the general requirements for the Bachelor of Arts degree, the requirements for the history major, and the requirements for Missouri certification in the teaching of history. See Education for further information. Contact the UMR history department for advising.

A minor in history is an option for non-majors who wish to complement their major field of study. This five-course option allows you to gain a broader perspective on human events and to develop your abilities in historical analysis.

The UMR Department of History and Political Science, in a cooperative agreement with the Department of History at UM-St. Louis, offers access to graduate study in history. Through the program, students may take up to 12 of their required hours for an M.A. in history on the UMR Campus. Students must be accepted by both the UM-St. Louis and UMR departments to be fully enrolled in the program. Contact the UMR Department of History and Political Science for further information.

In short, when you study history you not only learn important information and skills but you also are challenged to think, to communicate, and to cope with complexity.

## Faculty

### Professors:

- Wayne M. Bledsoe (Emeritus), Ph.D., Michigan State
- Russell D. Buhite, Ph.D., Michigan State
- Lawrence Christensen (Curators' Teaching Professor Emeritus), Ph.D., University of Missouri-Columbia
- H.J. Eisenman (Emeritus) Ph.D., Case Western Reserve
- Larry D. Gragg (Department Chair and Curators' Teaching Professor), Ph.D., University of Missouri-Columbia
- Jack Ridley (Curators' Teaching Professor Emeritus), Ph.D., Oklahoma

### Associate Professors:

- Diana Ahmad, Ph.D., University of Missouri-Columbia
- Patrick Huber, Ph.D., University of North Carolina
- Michael Meagher, Ph.D., Southern Illinois University
- Donald Oster (Emeritus), Ph.D., University of Missouri-Columbia
- Lance Williams (Emeritus) Ph.D., Georgia

### Assistant Professors:

- Shannon Fogg, Ph.D., University of Iowa
- John C. McManus, Ph.D., University of Tennessee
- Jeffrey W. Schramm, Ph.D., Lehigh University

## Bachelor of Arts History

(In addition to general requirements for Bachelor of Arts Degree.)

Major Hours	
History 175 . . . . .	3 credit hours
History 176 . . . . .	3 credit hours
History 299 . . . . .	3 credit hours

2 American History courses . . . . .	.6 credit hours
2 European History courses . . . . .	.6 credit hours
3 History Electives . . . . .	.9 credit hours
Total: . . . . .	.30 credit hours

NOTE: 9 hours of the 30 major hours must be taken at the 300 level.

NOTE: Entering students will normally take English 20 either semester of the first year.

## History-Teacher Education Program

You may earn a B.A. Degree in History from UMR and certification to teach in the schools of Missouri. This program may be completed in four academic years and student teaching is arranged with public schools within 30 miles of the Rolla campus.

Students interested in the Certification Program should consult with the advisor for History/Education majors in the Department of History or with the Education Coordinator for the University. Students participating in the Certification Program must have at least a 22 ACT, 265 C-BASE, PRAXIS, and maintain at least a 2.5 GPA. You must also submit a portfolio, complete a background check and fingerprinting and successfully complete the required courses.

## History Minor Curriculum

The History/Political Science Department offers a minor in history. To qualify, all students must take 15 hours of course work in history to include: (1) History 111 or 112; (2) 175 or 176; (3) An additional 9 hours of History 200 or 300 level courses.

## Science, Technology and Politics Minor

The Science, Technology and Politics (STP) minor is designed for students who want to explore the relationship between history, political science, and science and technology. The minor is particularly useful for technologically oriented students, because it provides insight into humanities and social science disciplines and how these disciplines interact with science and technology, thereby broadening their horizon of thought and action and preparing them for an increasingly technologically oriented future. To minor in STP the student must complete one of the following history survey courses: 111 or 112 or 175 or 176; and Political Science 90. After completing the required six hours, the student will select one of two options: The History of Science and Technology option; or the Politics and Public Policy option. Under the History of Science and Technology option, students will complete six additional hours from courses in history plus three hours in political science. Under the Politics and Public Policy option students will complete six additional hours in political science and three hours from history. The upper-level courses to satisfy degree requirements are as follows: HIST 270, 271, 274, 275, 280, or PHIL 345 and POL SC 237, 315, 317, and 325.

## History Courses

- 100 Special Problems** (IND 0.0-6.0) Problems or readings on specific subjects or projects in the department. Consent of instructor required.
- 101 Special Topics** (Variable 0.0-6.0) This course is designed to give the department an opportunity to test a new course. Variable title.
- 110 World Regional Geography** (LEC 3.0) An introduction to the distinguishing cultural and physical characteristics of the major regions of the world. Emphasis on the political problems within the regions and the contemporary issues involved.
- 111 Early Western Civilization** (LEC 3.0) Growth and development of ideas and institutions of western culture from prehistoric man to the voyages of discovery.
- 112 Modern Western Civilization** (LEC 3.0) A continuation of History 111 to the present with special emphasis on the philosophical, political, social, and economic backgrounds of modern society.
- 175 American History To 1877** (LEC 3.0) Survey of the history of the American colonies and United States from colonial times through Reconstruction.
- 176 American History Since 1877** (LEC 3.0) Survey of the history of America since Reconstruction.
- 200 Special Problems** (IND 0.0-6.0) Problems or readings on specific subjects or projects in the department. Consent of instructor required.
- 201 Special Topics** (Variable 0.0-6.0) This course is designed to give the department an opportunity to test a new course. Variable title.
- 210 Seminar** (IND 0.0-6.0) Discussion of current topics.
- 220 Making Of Modern Britain** (LEC 3.0) A survey of modern Britain from the era of Restoration and Glorious Revolution (1660-1689) to the present. Major themes include the social, intellectual, cultural, political and economic aspects of modern and contemporary Britain. Prerequisite: Hist 112.
- 222 The Making Of Modern France** (LEC 3.0) A survey of modern France from the era of Louis XIV (1660-1715) to the present. Major themes include the social, intellectual, cultural, political and economic aspects of modern and contemporary France. Prerequisite: Hist 112.
- 224 Making Of Modern Russia** (LEC 3.0) A survey of modern Russia from the era of "Westernization" and Peter the Great (1660-1725) to the present. Major themes include the social, intellectual, cultural, political and economic aspects of modern and contemporary Russia, with emphasis on the Soviet period. Prerequisite: Hist 112.
- 225 European Diplomatic History 1814 - Present** (LEC 3.0) A survey of European Diplomatic History beginning with The Congress of Vienna to the present, including the Congress system, the Eastern Question, the shift to realpolitik, the diplomatic origins and concluding conferences of the World Wars and Cold War diplomacy. Prerequisite: Hist 112.

- 226 Modern East Asia** (LEC 3.0) An analysis of the history of East Asia in the nineteenth and twentieth centuries. Topics include: social, historical, and intellectual traditions; imperialism and its impact; and the effects of World War II on Modern East Asia. Prerequisite: History 112 or 175 or 176.
- 237 Contemporary Political Thought** (LEC 3.0) This course will explore the impact of ideas on American politics and history, including the relationship between technological change and public policy; this will be pursued through the study of American political history, social institutions, and intellectual history. Prerequisite: Hist 175 or 176 or Pol Sc 90. (Co-listed with Pol Sc 237)
- 259 History Of Missouri** (LEC 3.0) Survey of Missouri's political, social, economic and cultural development from the beginning of settlement to the present. Prerequisite: Hist 175 or 176.
- 270 History Of Technology To 1900** (LEC 3.0) Technological achievements from prehistoric times to 1900; topics include agriculture, building and construction, communications, transportation, power sources, the Industrial Revolution, relationships between science and technology, factors in invention and innovation and sociocultural effects. Prerequisite: Hist 111 or 112 or 175 or 176.
- 271 Twentieth Century Technology And Society** (LEC 3.0) An investigation of technological achievements since 1900 and their effects on society. Topics include: education in a technological society, technology and the state, the individual and the environment, cybernation, agriculture, scientific and industrial research. Prerequisite: Hist 112 or 176.
- 274 Recent American Art And Technology** (LEC 3.0) This survey course investigates the relationships between recent American art and technology since 1945 and, as a consequence, technology's impact on American culture and society. Using examples of painting, sculpture and architecture the course treats the vernacular tradition, the use of technology in art, technological images in art, the impact of technology on art. Prerequisite: Hist 175 or 176 or Pol Sc 90.
- 275 History Of Science** (LEC 3.0) A survey of science from ancient times to the 20th century focusing on the leading conceptual developments within science, the scientific revolution, and science's role in society. Prerequisite: Hist 111 or 112 or 175 or 176.
- 280 The American Military Experience** (LEC 3.0) A study of American military history, strategy, policy and institutions from the colonial period to the present. War will be viewed in the mainstream of history with emphasis on the American Revolution, the Civil War, and the 20th century conflicts. Prerequisite: Hist 112 or 175 or 176 or Pol Sc 90.
- 299 Historiography** (LEC 3.0) Historical interpretation from Herodotus to the present. Emphasis will be placed on reading the works of prominent historians in analyzing the major developments in historical writing. Familiarization with historical source material will be another feature of this course. Serves as capstone course. Prerequisite: Sophomore standing.
- 300 Special Problems** (IND 0.0-6.0) Problems or readings on specific subjects or projects in the department. Consent of instructor required.
- 301 Special Topics** (Variable 0.0-6.0) This course is designed to give the department an opportunity to test a new course. Variable title.
- 302 Internship** (IND 0.0-6.0) Internship will involve students applying critical thinking skills and discipline specific knowledge in a work setting based on a project designed by the advisor and employee. Activities will vary depending on the student's background and the setting. Prerequisites: Senior status; must have completed 24 hours in major.
- 310 Seminar** (IND 0.0-6.0) Discussion of current topics. Prerequisite: Senior standing.
- 312 Tudor And Stuart England** (LEC 3.0) A study of England 1485 - 1689 covering the social, political, religious, and cultural developments. Prerequisite: Hist 111 or 220.
- 316 The American Presidency** (LEC 3.0) Historical development of the presidency; emphasis on the constitutional powers and limits of the office and the political contextual variables that influence presidential behaviors. Prerequisite: Pol Sc 90 or Hist 176. (Co-listed with Pol Sc 316)
- 321 Ancient Greece** (LEC 3.0) Aegean and Greek Civilization from Homeric times to the Roman Conquest of the Hellenic World. Designed for the student who wishes to understand the fundamental conditions of classical life and to comprehend the ideas that inspired action. Emphasis will be on social, intellectual, political and religious aspects of the classical world. Prerequisite: Hist 111.
- 322 Ancient Rome** (LEC 3.0) Rome 509 B.C. to 337 A.D. The Roman world from the founding of the Republic through the reign of constantine. Special emphasis is on the transformation of classical culture during the Republic and Imperial age. Prerequisite: Hist 111.
- 323 Medieval History I** (LEC 3.0) The Early Middle Ages, 284 A.D.-753 A.D., transition from ancient to Medieval civilization. The fundamental differences between Roman and Medieval ideas, institutions and life. The triumph of Christianity, the conditions which made this triumph possible and its role in the development of Western Europe. Prerequisite: Hist 111.
- 324 Medieval History II** (LEC 3.0) Medieval Civilization, 11th-13th centuries. The transition from Medieval to Modern world, developments in the political, social and economic institutions of the Medieval world and their enduring effect on Western European Civilization, conflict of faith and reason during this period. Prerequisite: Hist 111.
- 325 History Of Renaissance Thought** (LEC 3.0) Concentrates on the political, religious, and social thought of the Renaissance. Particular emphasis on the revival of the classics, the spread of hu-

manistic values, and reform efforts during the period with relationship to the material basis of society. Prerequisite: Hist 111 or 112.

- 327 Europe In The Age Of The French Revolution And Napoleon** (LEC 3.0) An in-depth examination of the causes, courses and results of the French Revolution and the Napoleonic Era (1789-1815). The impact of the age of the French Imperium upon European economic, diplomatic, intellectual, political and social development. Prerequisite: Hist 112.
- 328 Foundations Of Contemporary Europe 1815-1914** (LEC 3.0) Europe after Napoleon, development of democracy and nationalism, revolutionary movements and leaders, unification of Italy and Germany, national developments of the major powers and the road to the First World War are the bases of this course. Prerequisite: Hist 112.
- 329 Contemporary Europe** (LEC 3.0) First World War, the Versailles Peace Settlement and its aftermath, the Soviet, Fascist and Nazi revolutions and regimes, Western culture between the wars, the Second World War, the age of the atom and Cold War. Prerequisite: Hist 112.
- 340 Religion And Witchcraft In Early America** (LEC 3.0) An examination of the role of occult ideas and practices in the religious life of early Americans. Emphasis placed upon Puritan beliefs which contributed to seventeenth century effort to eradicate witchcraft. Prerequisite: Hist 175 or Hist 112.
- 341 Colonial America** (LEC 3.0) Political and social trends in America to 1754. Emphasis placed upon native American culture, Spain and France in America, population trends, family, religion, class structure, economic change, social conflict, and the development of individualism in early America. Prerequisite: Hist 175.
- 342 Revolutionary America, 1754-1789** (LEC 3.0) An examination of the causes and consequences of the American Revolution. Emphasis placed upon the social conditions in America which contributed to both the Revolution and the writing of the 1787 Constitution. Prerequisite: Hist 175.
- 343 Age Of Jefferson And Jackson** (LEC 3.0) Economic, political, social and constitutional development of the early American republic; the Federalist and Jeffersonian periods, Jacksonian Democracy, rise of sectionalism. Emphasis placed on historical interpretation and historiography of the period. Prerequisite: Hist 175.
- 344 Civil War And Reconstruction** (LEC 3.0) Lecture, discussion and readings on the causes and consequences of the American Civil War. Focuses on the prewar North-South sectional rivalry; impact of the war on American society, government and politics. Reconstruction including the development of racial crisis in United States history. Prerequisite: Hist 175.
- 347 Origins Of Modern America, 1877-1920** (LEC 3.0) Examines the industrial transformation of America, including the Gilded Age, The Populist-Progressive reform movement, urbanization, and the technological, social, cultural and intellectual responses to industrialization which provided the foundations for modern America. Prerequisite: Hist 176.
- 348 Recent United States History** (LEC 3.0) Examines America's modern age including the New Era, the New Deal, Internationalism, post-war affluence, the post-industrial era as well as the cultural, intellectual, social and technological features of American society from 1920 to the present. Prerequisite: Hist 176 or 347.
- 351 American Intellectual History I** (LEC 3.0) Deals with the ideas of intellectuals and the thought of popular culture, and with possible relationships between the two. Among the climates of opinion studied are the reformation in America, the Enlightenment, and Romanticism. Prerequisite: Hist 175.
- 352 American Intellectual History II** (LEC 3.0) The ideas of intellectuals and the thought of popular culture, and possible relationships between the two. Among the climates of opinion studied are the Gilded Age, Darwinism, Progressivism, the Twenties, the Great Depression, the Affluent Fifties, the Counter-Culture Sixties. Prerequisite: Hist 176 or 351.
- 353 History Of The Old South** (LEC 3.0) Analysis of the southern region of the United States between 1607-1861 with emphasis on economic, social, political, intellectual, and racial themes. Prerequisite: Hist 175.
- 354 History Of The Modern South** (LEC 3.0) Analysis of the southern region of the United States between 1877 and the present with emphasis on economic, social, political, intellectual, and racial themes. Prerequisite: Hist 176.
- 355 The History Of Black America** (LEC 3.0) Examines Afro-American experience from the beginnings of the slave trade to the present. Cultural, economic, and civil rights topics are treated. Prerequisite: Hist 175 or 176.
- 356 History Of The American City** (LEC 3.0) A social, political, economic and cultural survey of the American city from colonial times to late-20th century. Urbanization is approached as an independent variable in American history. Prerequisite: Hist 175 or 176.
- 357 The History Of The West** (LEC 3.0) This class examines the American settlement of the Trans-Mississippi West. Areas to be considered include cattle, mining, exploring, women, and Native Americans. Traditional and contemporary views of the West will be analyzed. Prerequisite: Hist 175 or 176.
- 358 American Constitutional History** (LEC 3.0) Emphasis on the history of American legal and constitutional systems. The role of the Supreme Court will be examined and critical constitutional decisions analyzed. Special emphasis will be on the history of the federal judiciary from 1801 to the present. Prerequisite: Hist 175 or 176.

- 360 History Of The American Family** (LEC 3.0) Beginning with an examination of the family in Western Europe c. 1600, the course traces the development of the family in America to the present. Prerequisite: Hist 175 or 176.
- 370 History Of Baseball** (LEC 3.0) This course will survey and interpret the history of baseball from its earliest beginnings down to the present. Main focus will be on the evolution of the professional game in all of its facets. Prerequisite: Hist 175 or 176.
- 380 20Th Century Americans In Combat** (LEC 3.0) Through lectures, films, readings, exams, film reviews and discussions, this course examines the American military and combat experience throughout much of the twentieth century. The ultimate goal of the course is for students to understand the realities of warfare and its effect on ordinary Americans as well as American society. Prerequisite: Hist 175 or 176 or 112.
- 381 The United States In World War II** (LEC 3.0) Through lectures, readings and film this course will explore the American experience in World War II. The course will particularly focus on the war's American major battles along with the war's effect on Americans in combat and on the home front. Prerequisite: Hist 175 or 176.
- 382 The United States in Vietnam** (LEC 3.0) Through lecture, film and readings, this course examines the American experience in the Vietnam War. The course covers the causes and consequences of the war as well as its effect on those who fought and on American society as a whole. There is a special emphasis on the realities of combat and the war's impact on individual Americans. Prerequisite: History 176.
- 383 U.S. Diplomatic History to World War II** (LEC 3.0) This course is a history of American foreign relations, broadly conceived, from the War for Independence to WWII. Among other things, it deals with the diplomacy of survival, of expansion and of economic and political hegemony. Prerequisites: Hist 175, 176 or Pol Sc 90. (Co-listed with Pol Sc 383)
- 384 American Diplomatic History Since World War II** (LEC 3.0) American Diplomatic History Since World War II will address the major issues in American foreign policy from WWII to the present. Its primary focus is on the Cold War and the post-Cold War problems the U.S. has faced. Prerequisite: History 176 or Pol Sci 90. (Co-listed with Pol Sci 384)

## Latin

### Latin Courses

- 101 Special Topics** (Variable 0.0-6.0) This course is designed to give the department an opportunity to test a new course. Variable title.

## Mathematics & Statistics

### Bachelor of Science (Applied Mathematics)

### Master of Science (Applied Mathematics)

### Master of Science for Teachers (Mathematics)

### Doctor of Philosophy (Mathematics)

Emphasis areas at the Bachelor of Science level include actuarial science, algebra/discrete mathematics, applied analysis, computational mathematics and statistics. Emphasis areas at the doctor of philosophy level of mathematics include analysis, differential and functional equations, and statistics.

Mathematics is a universal language. It is one which scientists use to express ideas and relationships concisely. It is a tool, which they use to investigate problems.

As a mathematician, you will set up and analyze models of physical situations in order to deduce new information and to predict results.

Most students pursue their study of mathematics through a differential equations course and then elect courses in specialized areas such as algebra, analysis, geometry, topology, and statistics. Supporting study in technical electives is required from other departments. Such study includes analytical mechanics, communication theory, control theory, and others.

Your classes, for the most part, will be held in the Rolla Building. You will be provided data processing and computational services to solve complex problems through the computer facilities. (See computer science description.)

You will find that mathematics contributes to the growth in knowledge in most areas. Your program at UMR will emphasize breadth in mathematics and depth in an associated area of application.

### Faculty

#### Professors:

Leon Hall (Department Chair), Ph.D., Missouri-Rolla  
Steve Clark, Ph.D., Tennessee

V.A.Samaranayake, Ph.D., Kansas State  
 Wlodzimierz Charatonik, Ph.D., Warsaw

**Associate Professors:**

Martin Bohner, Ph.D., Ulm  
 Roman Dwilewicz, D.Sc., Warsaw  
 Gaoxiong Gan, Ph.D., Kansas State  
 David Grow, Ph.D., Nebraska-Lincoln  
 Roger Hering, Ph.D., Southern Illinois  
 E. Matt Insall, Ph.D., Houston  
 Vy Le, Ph.D., Utah  
 Ilene Morgan, Ph.D., Penn State  
 Robert Roe, Ph.D., Wyoming

**Assistant Professors:**

Elvan Akin-Bohner, Ph.D., Nebraska  
 Miron Bekker, Ph.D., Inst. of Mathematics, NAS, Kiev  
 David Drain, Ph.D., Arizona State  
 Gary Gadbury, Ph.D., Colorado State  
 Xuerong (Meggie) Wen, Ph.D., Minnesota

**Instructors:**

Tom Akers, M.S., Missouri-Rolla  
 Kimberly Kinder, M.S., Central Missouri State  
 Mary Kirgan, M.S.T., Missouri-Rolla  
 David Leach, M.S., Santa Clara University

**Emeritus Faculty:**

Lee Bain, Ph.D., Oklahoma State  
 August Garver, M.S., Missouri-Rolla  
 Louis Grimm, Ph.D., Minnesota  
 Glen Haddock, Ph.D., Oklahoma State  
 Troy Hicks, Ph.D., Cincinnati  
 W. Thomas Ingram, Ph.D., Auburn  
 James Joiner, Ph.D., George Peabody  
 Jagdish Patel, Ph.D., Minnesota  
 Anthony Penico, Ph.D., Pennsylvania  
 Lyle Pursell, Ph.D., Purdue  
 Caslav Stanojevic, Sc.D., Belgrade  
 Selden Trimble, Ph.D., Kentucky

**Bachelor of Science  
 Applied Mathematics**

**FRESHMAN YEAR**

First Semester	Credit
Math 1-Intro to Math	.1
Math 8-Calculus w/Analytic Geometry I <sup>1</sup>	.5
Chem 4-Intro to Lab Safety & Haz Mat	.1
English 20-Exposition & Argumentation	.3
Campus History Requirement <sup>2</sup>	.3
Foreign Language Requirement <sup>3</sup>	.4
Basic ROTC (if elected) <sup>4</sup>	.0
	<u>17</u>

**Second Semester**

Math 21-Calculus w/Analytic Geometry II <sup>1</sup>	.5
Science Requirement <sup>5</sup>	.5
Cmp Sc 53 or 73 & 77 or Cmp Sc 74 & 78	.3
Foreign Language Requirement <sup>3</sup>	.4
Basic ROTC (if elected) <sup>4</sup>	.0
	<u>17</u>

**SOPHOMORE YEAR**

First Semester	Credit
Math 22-Calculus w/Analytic Geometry III <sup>1</sup>	.4
Math 208-Linear Algebra I <sup>1</sup>	.3
Statistics Requirement <sup>1,6,7</sup>	.3

Physics 21-General Physics I	.4
Physics 22-General Physics Lab	.1
English 60-Writing & Research	.3
Basic ROTC (if elected) <sup>4</sup>	.0
	<u>18</u>

**Second Semester**

Math 204-Elementary Differential Equations <sup>1</sup>	.3
Math 209-Foundations of Mathematics <sup>1</sup>	.3
Econ 121-Microecon or 122-Macroecon	.3
Physics 25-General Physics II	.4
Physics 26-General Physics Lab	.1
Computer Science Requirement <sup>7,8</sup>	.3
Basic ROTC (if elected) <sup>4</sup>	.0
	<u>17</u>

**JUNIOR YEAR**

First Semester	Credit
Math 309-Advanced Calculus I <sup>1</sup>	.3
Literature	.3
Electives-Math or Stat <sup>1,7,9</sup>	.3
Electives-Technical <sup>10</sup>	.3
Electives	.3
	<u>15</u>

**Second Semester**

Math 311-Advanced Calculus II <sup>1</sup>	.3
Literature	.3
Electives-Math or Stat <sup>1,7,9</sup>	.3
Electives-Technical <sup>10</sup>	.3
Electives	.3
	<u>15</u>

**SENIOR YEAR**

First Semester	Credit
Math 361-Problem Solving Pure Math <sup>1,11</sup>	.1
Math 371-Problem Solving Applied Math <sup>1,11</sup>	.1
Electives-Math or Stat <sup>1,7,9</sup>	.3
Electives-Technical <sup>10</sup>	.6
Electives	.6
	<u>17</u>

**Second Semester**

Math 381-Great Theorems in Math <sup>1,11</sup>	.1
Electives-Math or Stat <sup>1,7,9</sup>	.3
Electives-Technical <sup>10</sup>	.3
Electives	.9
	<u>16</u>

<sup>1)</sup> A minimum grade of "C" is required by the department in each course counted toward the Math/Stat requirement for the B.S. in Applied Mathematics. Moreover, the department requires that an average of at least two grade points per credit hour must be obtained for all courses taken within the department.

<sup>2)</sup> May be met by History 112, 175, 176, or Pol Sc 90.

<sup>3)</sup> A modern language approved by the advisor (six hours credit is acceptable from transfer students.) Requirement may be met by examination or, with approval of the department, by three years of foreign language in high school.

<sup>4)</sup> Basic ROTC may be elected in the freshman and sophomore years, but is not creditable toward a degree. Up to six credit hours of advanced ROTC may be credited as free electives towards a degree.

<sup>5)</sup> May be met by Chem 1 and 2 or by Bio Sc 110 and 112.

<sup>6)</sup> May be met by Stat 215, 217, or 343.

- <sup>7)</sup> No course may be used to satisfy more than one degree requirement.
- <sup>8)</sup> May be met by Cmp Sc 153, 158 or 228.
- <sup>9)</sup> The student must choose two from the following five groups and then complete six hours in each of the chosen groups (1) Math 305, 306, 307, 308; (2) Math 315, 330, 351, 385; (3) Math 302, 303, 322, 325, 351, 383; (4) Stat 343, 344, 346, 353; (5) Cmp Sc 228, 328, 329, Stat 346, Math 303, Econ 321.
- <sup>10)</sup> Courses in chemistry, physics, mechanics, geology, computer science, economics or engineering approved by advisor.
- <sup>11)</sup> The three courses Math 361, 371, and 381, constitute the Capstone experience for mathematics majors.

### Math Minor Curriculum

The minor will consist of at least 12 hours of mathematics/statistics courses at the 200\* or higher level, 9 hours of which must be completed in residence at UMR, and passing all of them with at least a grade of "C". Further, at least 3 of the 12 hours must be at the 300 or higher level. Finally, Math 204 and Math 229 cannot both be counted, Math 203 and Math 208 cannot both be counted, and at most one of Stat 211, Stat 213, Stat 215 and Stat 217 may be counted.

\*Computer Science 228 (Introduction to Numerical Methods) may be substituted for one of these courses.

### Bioinformatics Minor

Students majoring in Mathematics are eligible to pursue a minor in bioinformatics. See the description of the bioinformatics minor under the heading Arts and Sciences.

## Emphasis Areas at the Bachelor of Science Level<sup>12</sup>

### Actuarial Science Emphasis Area<sup>12</sup>

Required courses:

Stat 343-Probability and Statistics	3
Stat 344-Mathematical Statistics	3
Stat 346-Regression Analysis	3
Stat 353-Statistical Data Analysis	3
Econ 121-Principles of Microeconomics	3
Econ 122-Principles of Macroeconomics	3
Econ 222-Intermediate Macroeconomic Theory	3
Econ 321-Finance	3

In addition, the student must pass the first Actuarial Science Exam.

### Algebra/Discrete Mathematics Emphasis Area<sup>12</sup>

Required courses:

Math 305-Modern Algebra I	3
Math 306-Modern Algebra II or Math 405 Finite Flds	3
Math 307-Combinatorics	3

Math 308-Linear Algebra II	3
Stat 343-Probability & Statistics	3
and three hours from:	
Stat 344-Math Statistics	3
Cmp Sc 228-Intro to Numerical Methods	3
Cmp Sc 330-Formal Language & Automata Theory I	3
Cmp Sc 355-Analysis of Algorithms	3

### Computational Mathematics Emphasis Area<sup>12</sup>

Required courses:

Stat 353-Stat Data Analysis	3
Stat 346-Regression Analysis	3
Cmp Sc 228-Intro to Numerical Methods	3
and six hours from:	
Math 302-Intermediate Differential Equations	3
Math 303-Mathematical Modeling	3
Math 325-Partial Differential Equations	3
and three hours from:	
Cmp Sc 328-Object-Orient Num Mod I	3
Cmp Sc 329-Object-Orient Num Mod II	3
EMech 307-Finite Element Approx	3

### Applied Analysis Emphasis Area<sup>12</sup>

Required:  
 Cmp Sc 228-Intro to Numerical Methods 3  
*and* two of groups 3, 4, and 5 under Mathematics of Statistics electives must be satisfied.  
*and* choose Technical Electives and Free Electives to satisfy one of the following two options:

### Engineering Option (A)

Required courses:

Bas Eng 50-Statics	3
Bas Eng 110-Mechanics of Materials	3
<i>And one of the following two courses:</i>	
Bas Eng 150-Eng Mech-Dynamics	2
EMech 160-Eng Mech-Dynamics	3
And nine hours from the following list. Courses, which have any of the listed courses as prerequisites, may also be used to fulfill this requirement. Courses with an asterisk (*) are co-listed in more than one department.	
Ae Eng 213-Aerospace Mechanics I	3
Ae Eng 207-Vibrations I*	3
Ae Eng 313-Interm Dyn of Mech & Ae Sys	3
Ae Eng 314-Spaceflight Mech	3
Ch Eng 120-Chem Eng Mat Bal	3
Ch Eng 141-Chem Eng Thermodynamics I	3
Cv Eng 218-Structural Analysis	3
EI Eng 281-Elec Cir or EI Eng 282-Elec Cir & Mach	3
Mc Eng 213-Machine Dynamics	3
Mc Eng 219-Thermo or Mc Eng 227-Thermal Analysis	3
Mc Eng 331-Thermo Fluid Mech II*	3
Nu Eng 203-Interactions of Radiation w/Matter	3
Nu Eng 303-Reactor Physics I	3
Pe Eng 141-Prop of Hydrocarbon Fluids	3
Pe Eng 320-Fund of Petro Reservoir Simulation	3
Cv Eng 230-Elem Fluid Mech or Nu Eng 221-Reactor Fluid Mech or Mc Eng 231-Thermo Mech I	3



Cv Eng 323-Class & Matrix Meth of Struct Analysis . . .3  
 Cv Eng 333-Intermediate Hydraulic Eng . . . . .3  
 El Eng 368-Intro to Neural Networks & Appl . . . . .3  
 EMech 307-Finite Element Approx I . . . . .3  
 EMech 311-Intro to Continuum Mechanics . . . . .3  
 EMech 334-Stability of Eng Structures\* . . . . .3  
 EMech 354-Variational Form of Mech Problems . . . . .3  
 Ge Eng 315-Geometrics . . . . .3  
 Geo 286-Intro to Geop Data Analysis or Geop 286-Intro to Geop Date Analysis . . . . .3  
 Geop 321-Potential Field Theory . . . . .3

**Physics Option (B)**

Required courses:  
 Physics 207-Modern Physics I . . . . .3  
 Physics 307-Modern Physics II . . . . .3

**And take at least nine additional hours of physics courses at the 200 level or above. Note that the requirements for a minor in physics will be satisfied with this option.**

**Statistics Emphasis Area<sup>12</sup>**

Required courses:  
 Stat 343-Prob & Stat . . . . .3  
 Stat 344-Math Stat . . . . .3  
 Stat 346-Regression Analysis . . . . .3  
 Stat 353-Stat Data Analysis . . . . .3

**and complete 6 hours from:**  
 Bio Sc 231-General Genetics . . . . .3  
 Cmp Sc 228-Intro to Numerical Methods . . . . .3  
 Eng Mg 385-Statistical Process Control . . . . .3

**and complete either A or B:**  
**(A) Complete the following two courses:**  
 Math 315-Intro to Real Analysis . . . . .3  
 Math 351-Intro to Complex Variables . . . . .3  
**(B) Complete 6 hours from:**  
 Math 303-Math Modeling . . . . .3  
 Math 307-Comb & Graph Theory . . . . .3  
 Math 308-Linear Algebra II . . . . .3

<sup>12</sup> Note: It is not required that students complete an emphasis area to obtain the Bachelor of Science degree in Applied Mathematics. The emphasis area requirements often specify most, if not all, of the electives in Mathematics, Statistics and Computer Science as well as many technical or free electives.

**Mathematics Courses**

- 1 **Introduction To Mathematics** (LEC 1.0) Introduction to the department, program of study, methods of study, and an introduction of the various areas of mathematics. Required of fall semester freshman mathematics majors.
- 2 **College Algebra** (LEC 5.0) Contains the same topics as covered in Math 4, and preceded by a thorough review of the basic principles of algebra. Prerequisite: By placement examination.
- 3 **Fundamentals Of Algebra** (LEC 3.0) Basic principles of algebra including the number line and an introduction to equations and inequalities, polynomials, rational expressions, exponents and rad-

- icals, the quadratic formula and functions. Prerequisite: Entrance requirements.
- 4 **College Algebra** (LEC 3.0) A study of linear equations, rational functions, radicals, quadratic equations, inequalities, determinants, progressions, theory of equations, permutations, combinations, and the binomial theorem. Prerequisite: By placement examination.
  - 6 **Trigonometry** (LEC 2.0) A study of the trigonometric functions, radian measure, graphing trigonometric functions, identities, trigonometric equations and inverse trigonometric functions. Solutions of general triangles and trigonometric representation of complex numbers are included. Prerequisite: By placement examination.
  - 8 **Calculus With Analytic Geometry I** (LEC 5.0) A study of limits, continuity, differentiation and integration of algebraic and trigonometric functions. Applications of these concepts in physical as well as mathematical settings are considered. Credit will only be given for one of Math 8 or Math 14. Prerequisites: Math 6 and either of Math 2 or 4 with a grade of "C" or better; or by placement exam.
  - 10 **Introduction To Mathematical Ideas** (LEC 3.0) A course for non-science majors, including liberal arts and education majors. A study of the nature of mathematics and its relation to western culture, number systems, sets, functions, and selected topics from algebra, computer science and other areas of mathematics. Prerequisite: Two years high school mathematics.
  - 12 **Business Calculus** (LEC 3.0 and LAB 1.0) Calculus for Bus. & Mgt. Sys, Econ & Finance, or Info. Sci. & Tech; also possibly Bio. Sci, Soc. Sci. or Humanities. Derivatives, optimization, exponential and logarithmic functions, integration, multivariate functions, partial derivatives, Lagrange multipliers, applications. May not be used as a prerequisite for either Math 15 or Math 21. Prerequisite: Math 4 with a grade of "C" or better; or by placement exam.
  - 14 **Calculus For Engineers I** (LEC 3.0 and LAB 1.0) Introduction to limits, continuity, differentiation and integration of algebraic and elementary transcendental functions. Applications in physical science and engineering. Credit will be given for only one of Math 008 or Math 014. Prerequisites: Math 006 and either of Math 2 or 4 with a grade of "C" or better; or by placement exam.
  - 15 **Calculus For Engineers II** (LEC 3.0 and LAB 1.0) Continuation of Math 014. Transcendental functions, techniques of integration, sequences, series including power series, polar coordinates, polar and parametric equations. Applications in physical science and engineering. Credit will be given for only one of Math 015 or Math 021. Prerequisites: Math 006 and either Math 008 or Math 014 both with a grade of "C" or better; or by placement exam.
  - 21 **Calculus With Analytic Geometry II** (LEC 5.0) A continuation of Math 8; differentiation and inte-

- gration of elementary transcendental functions, integration techniques, improper integrals, conic sections, polar coordinates, introduction to sequences and series. Credit will only be given for one of Math 21 or Math 15. Prerequisites: Math 6 and either Math 8 or Math 14 both with a grade of "C" or better; or by placement exam.
- 22 Calculus With Analytic Geometry III** (LEC 4.0) The calculus of vector-valued functions is introduced. Partial differentiation and multiple integration are studied along with curves and surfaces in three dimensions. Additional topics selected from: line integrals, surface integrals, Green's theorem and the divergence theorem. Prerequisite: Math 15 or Math 21 with a grade of "C" or better.
- 100 Special Problems** (IND 0.0-6.0) Problems or readings in specific subjects or projects in the department. Consent of instructor required.
- 101 Special Topics** (Variable 0.0-6.0) This course is designed to give the department an opportunity to test a new course. Variable title.
- 200 Special Problems** (IND 0.0-6.0) Problems or readings in specific subjects or projects in the department. Consent of instructor required.
- 201 Special Topics** (Variable 0.0-6.0) This course is designed to give the department an opportunity to test a new course. Variable title.
- 202 Cooperative Work Training** (IND 0.0-6.0) On-the-job experience gained through cooperative education with industry. Variable credit arranged with the advisor. P/F grading option is required and maximum credit per semester is 3 hrs., maximum for entire program is 6 hrs.
- 203 Matrix Algebra** (LEC 3.0) Matrix algebra is introduced by means of systems of linear algebraic equations. Gaussian elimination, least squares solutions, orthogonalization, determinants, eigenvalues and an introduction to vector spaces are discussed. Credit will not be given for both Math 203 and 208. Prerequisite: Math 22 with a grade of "C" or better.
- 204 Elementary Differential Equations** (LEC 3.0) First order differential equations and linear differential equations of higher order are studied. The Laplace transform and systems of linear equations as well as selected physical applications are covered. Credit will not be given for both Math 229 and Math 204. Prerequisite: Math 22 with a grade of "C" or better.
- 208 Linear Algebra I** (LEC 3.0) Systems of linear equations, matrices, vector spaces, inner products, linear transformations, determinants, and eigenvalues are studied. Prerequisite: Math 15 or 21 or 22 with a grade of "C" or better.
- 209 Foundations Of Mathematics** (LEC 3.0) An introduction to mathematical reasoning through an axiomatic development of mathematical systems. A strong emphasis is placed on getting the student to understand what constitutes a sound mathematical argument. Prerequisite: Math 15 or 21 or 22 with a grade of "C" or better.
- 221 Teaching Math In Elementary And Middle Schools** (LEC 3.0) The course presents an overview of how children learn mathematics, various techniques in teaching mathematics, and examples of applying these techniques to specific mathematical concepts (such as geometry, measurement, basic operations, statistics and probability, etc.). Prerequisite: Educ 40 or Math 2 or 4. (Co-listed with Educ 221)
- 222 Geometric Concepts For Elementary Teachers** (LEC 3.0) The course covers methods of teaching the study of points, lines, polygons, similarity, congruence, constructions, and proof in Euclidean Plane Geometry. Transformational geometry and trigonometry are introduced to elementary teachers. Prerequisite: Educ 40 or Math 2 or 4. (Co-listed with Educ 222)
- 229 Elementary Differential Equations And Matrix Algebra** (LEC 3.0) This course is a combination of selected topics from Math 203 and 204. Solutions of linear differential equations and systems of linear algebraic equations are emphasized. Credit will not be given for both 204 and 229. Prerequisite: Math 22 with a grade of "C" or better.
- 240 Mathematical Software Applications In The Classroom** (LEC 3.0) Students will be introduced to a variety of Mathematical Software applications, both PC and calculator based which will aid teachers in presenting concepts and in classroom management. Specific topics covered will be selected based on student interest. Prerequisites: Math 22 and admission to the MST program.
- 300 Special Problems** (IND 0.0-6.0) Problems or readings on specific subjects or projects in the department. Consent of instructor required.
- 301 Special Topics** (Variable 0.0-6.0) This course is designed to give the department an opportunity to test a new course. Variable title.
- 302 Intermediate Differential Equations** (LEC 3.0) Linear differential equations, vector-matrix systems, existence and uniqueness theory, nonlinear systems, phase-plane analysis, introduction to stability theory. Prerequisite: Math 204 or Math 229.
- 303 Mathematical Modeling** (LEC 3.0) Model construction and the modeling process, model fitting, models requiring optimization, empirical model construction, modeling dynamic behavior. Individual and team projects. Prerequisites: Math 204 or 229 with a grade of "C" or better, Programming competency.
- 305 Modern Algebra I** (LEC 3.0) The abstract concepts of a group and a ring are introduced. Permutation groups, subgroups, homomorphisms, ideals, ring homomorphisms and polynomial rings are studied. Prerequisite: Math 209.
- 306 Modern Algebra II** (LEC 3.0) This course is a continuation of Math 305. Rings and fields are discussed. Euclidean domains, principal ideal domains, unique factorization domains, vector

spaces, finite fields and field extensions are studied. Prerequisite: Math 305.

- 307 Combinatorics And Graph Theory** (LEC 3.0) Covers some basics of enumeration and graph theory. Topics are selected from the following: permutations combinations, the inclusion/exclusion principle, generating functions, recurrence relations, trees, networks, graph connectivity and graph coloring. Prerequisite: Cmp Sc 158 or Math 209.
- 308 Linear Algebra II** (LEC 3.0) Eigenvalue problems, Cayley-Hamilton theorem, Jordan normal form, linear functionals, bilinear forms, quadratic forms, orthogonal and unitary transformations, selected applications of linear algebra. Prerequisite: Math 208.
- 309 Advanced Calculus I** (LEC 3.0) Completeness of the set of real numbers, sequences and series of real numbers, limits, continuity and differentiability, uniform convergence, Taylor series, Heine-Borel theorem, Riemann integral, fundamental theorem of calculus, Cauchy-Riemann integral. Prerequisite: Math 209 or a 300-level mathematics course or graduate standing.
- 311 Advanced Calculus II** (LEC 3.0) Euclidean  $n$ -space, differentiation and integration of scalar functions of several variables, maxima and minima theory, change of variables, differentiation and integration of vector functions of several variables, Divergence theorem, Stokes' theorem. Prerequisite: Math 309.
- 312 Introduction To Differential Geometry** (LEC 3.0) Elements of the geometry of curves and surfaces in Euclidean three-space using methods of advanced calculus and vectors. Prerequisite: Math 309 or Math 322.
- 315 Introduction To Real Analysis** (LEC 3.0) Riemann-Stieltjes integration, sequences and series of functions, uniform approximation, the Banach Space  $C(a,b)$ , Lebesgue measure and integration, the space  $LP(a,b)$ , Fourier series. Prerequisite: Math 309.
- 322 Vector And Tensor Analysis** (LEC 3.0) Vector algebra, vector differential and integral calculus, line and surface integrals, theorems of Stokes and Gauss, tensor algebra and tensor analysis, applications to problems in kinematics, elasticity theory, fluid mechanics, electromagnetic theory, relativity theory. Prerequisite: Math 22; Math 203 or Math 208.
- 325 Partial Differential Equations** (LEC 3.0) Linear equations, heat equation, eigenfunction expansions, Green's formula, inhomogeneous problems, Fourier series, wave equation. Prerequisite: Math 204 with a grade of "C" or better.
- 330 Topics In Geometry** (LEC 3.0) A survey of non-Euclidean geometries, finite geometries, affine and projective planes, metric postulates for the Euclidean plane, and selected topics. Prerequisite: Math 208.
- 337 Financial Mathematics** (LEC 3.0) The course objective is to provide an understanding of the fundamental concepts of financial mathematics. Topics include pricing, assets-liability management, capital budgeting, valuing cash flow, bonds, futures, swaps, options. Preparation for the financial mathematics actuarial exam will be provided. Prerequisite: Math 15 or Math 21, Econ 221 or Econ 222 or Econ 250 or Econ 321, Stat 211 or Stat 213 or Stat 215 or Stat 217 or Stat 343 (Co-listed with Fin 337).
- 340 Mathematical Analysis For Secondary Teachers** (LEC 3.0) Designed to help teachers gain a deeper understanding of the fundamental idea in analysis, that of a limit. A discovery method is used which includes both individual and group work. Students will present their results in written and oral format. Prerequisite: Math 22 or equivalent.
- 341 Mathematical Analysis For Secondary Teachers Practicum** (LEC 1.0) An instructional unit based on the discovery method used in Math 340 will be designed by each student. These units will be class tested. The unit and results of class testing will be presented both in written and oral format. Prerequisite: Math 340.
- 351 Introduction To Complex Variables** (LEC 3.0) The basic tools of complex variables are studied. These include the Cauchy-Riemann equations, complex contour integration, the Cauchy-Goursat theorem, conformal mappings, the calculus of residues and applications to boundary value problems. Prerequisite: Math 204.
- 354 Mathematical Logic I** (LEC 3.0) A mathematical introduction to logic with some applications. Functional and relational languages, satisfaction, soundness and completeness theorems, compactness theorems. Examples from Mathematics, Philosophy and/or Computer Science. Prerequisite: Philos 15 with junior standing or Math 305 or Comp Sci 253. (Co-listed with Philos 354 and Comp Sci 354)
- 357 Engineering Mathematics I** (LEC 3.0) Topics in vector analysis, matrices, and determinants, Laplace transform, complex variables. Prerequisite: Math 204.
- 358 Engineering Mathematics II** (LEC 3.0) Infinite series, Fourier series, partial differential equations. Boundary value problems, the Fourier Integral, Bessel and Legendre functions. Prerequisite: Math 204.
- 361 Problem Solving In Pure Mathematics** (LEC 1.0) Problems from pure mathematics, including analysis, algebra, number theory, set theory, finite mathematics, probability and statistics. Emphasis on identifying or inventing ways to solve problems based on the student's entire mathematics background. Prerequisites: Corequisite Math 309 and Senior standing.
- 371 Problem Solving In Applied Mathematics** (LEC 1.0) Problems from applied mathematics which are open-ended, and do not always have a

unique correct solution. Emphasis on developing mathematical models and writing solution narratives, including clarity, analysis, and design. Prerequisites: Math 209 and Senior standing.

- 381 Great Theorems In Mathematics** (LEC 1.0) A study of some of the great theorems which have shaped the development of mathematics and human civilization. History, the changing nature of mathematics, and the mathematical content of the theorems themselves, will all be addressed. Sources as close to the originals as possible will be used. Prerequisites: Math 209 and Senior standing.
- 383 Operational Calculus** (LEC 3.0) The Laplace transformation, properties of the transformation, various applications to ordinary and partial differential equations, systems with step and Dirac functions as driving forces, various non-elementary functions and their transforms, problems in heat conduction and wave motion, Fourier transforms and their operational properties. Prerequisite: Math 204.
- 385 Introduction To Topology** (LEC 3.0) Metric spaces; general topological spaces; connectedness, compactness, separation properties, functions and continuity. Prerequisite: Math 309.
- 390 Undergraduate Research** (IND 0.0-6.0) This course is designed for the undergraduate student who wishes to engage in research. It is not to be used for graduate credit nor for more than six credit hours of undergraduate credit. The subject and credit are to be arranged with the instructor. Prerequisite: Consent of instructor.

## Military Science

### Army ROTC

The Department of Military Science is responsible for the Army Reserve Officers' Training Corps Program. ROTC is a program of leadership and basic military skill training which prepares students to serve as officers in the Total Army—the Active Army, the Army Reserve, and the Army National Guard—after graduation. Army ROTC can help you succeed during college and after graduation. You can gain the confidence and self-discipline needed to meet the academic challenge of UMR through military science courses and can acquire the leadership skills, which will impress employers when you enter the work force.

The Army ROTC program is flexible, and allows students to participate in the first two years of the program without obligation. Alternate entry programs for students with prior military service, transfer students, and students serving in the Army Reserve or National Guard are available. The Advanced Course, Junior and Senior years), focuses on preparing cadets for officership, and requires a commitment to the ROTC program. Students who wish to take Military Science courses, but who do not wish to participate in Army ROTC, may do so with the approval of the Department Chairman.

Military Science classes are taught on the UMR campus and are supplemented by one weekend field training exercise at Fort Leonard Wood, MO. each semester for contracted ROTC cadets. The ROTC program concentrates on the whole person and includes physical training, leadership development, marksmanship, individual tactical skills, and essential knowledge of today's Army and its role in our society.

The minor in military science gives formal academic recognition for the leadership and management training received by those completing the entire Army ROTC program.

The Military Science program at UMR is described in detail in the Appendix/Army ROTC (Military Science) of this catalog. For more information on the Military Science Program, scholarships, qualification and obligation, and extracurricular activities, contact the Department in 301 Harris Hall or phone 341-4744.

### Faculty

#### Professor:

Lt. Col Joseph A. Herdade, (Department Chair), M.A., Webster University

#### Assistant Professors:

Cpt. Chad Pense, M.ED., Univ. of Central Oklahoma

#### Instructors:

SFC Ramon Bonilla

MSG Harry Howery

### Military Science Minor Curriculum

#### Required courses:

Mil Sc 105	Leadership & Problem Solving
Mil Sc 106	Leadership and Ethics
Mil Sc 207	Leadership, Mgt, and Ethics
Mil Sc 208	Officership

#### Elective courses:

History	(select one course)
History 280	The American Military Experience
History 329	Contemporary Europe
History 348	Recent United States History
Human Behavior	(select one course)
Psychology 050	General Psychology
Philosophy 015	Introduction to Logic
Philosophy 025	Ethics of Engineering Practice
Sociology 081	General Sociology

### Military Science Courses

- 10 Ranger Operations** (LEC 1.0) Learn about one of the world's most elite fighting forces -the U. S. Army Rangers. Get some hands-on training with actual army equipment. Learn rappelling, land navigation, orienteering and combat patrolling.
- 15 Leadership and Personal Development** (LEC 1.0) Introduces cadets to the personal challenges and competencies that are critical for effective leadership. Cadets learn how the personal development of life skills such as critical thinking, goal setting, time management, physical fitness, and stress management relate to leadership, officership, and the Army profession.
- 20 Rifle Marksmanship** (LEC 1.0) The course teaches basic rifle marksmanship and firearm

safety. Students will be required to learn common rules of firearms safety and fire airguns using standard firing positions. Targets will be scored. Students will also become familiar with military marksmanship techniques and weapons.

- 25 Introduction to Tactical Leadership** (LEC 1.0) Overviews leadership fundamentals such as setting direction, problem-solving, listening, presenting briefs, providing feedback, and using effective writing skills. Cadets explore dimensions of leadership values, attributes, skills, and actions in the context of practical, hands-on, and interactive exercises.
- 30 Wilderness Survival And Life-Saving Techniques** (LEC 1.0) Basic life-saving techniques that will enable the student to assist an injured person or himself in an emergency, and survival techniques that will help the student survive in the wilderness.
- 35 Innovative Team Leadership** (LEC 3.0) Develop knowledge of self, self-confidence and individual leadership techniques through problem solving and critical thinking skills. Apply communication, feedback, and conflict resolution skills.
- 40 Foundations of Tactical Leadership** (LEC 3.0) Examines the challenges of leading tactical teams in the complex contemporary operating environment (COE). The course highlights dimensions of terrain analysis, patrolling, and operation orders. Further study of the theoretical basis of the Army leadership framework explores the dynamics of adaptive leadership in the context of military operations.
- 50 Army Physical Readiness Program** (LAB 1.0) Course instruction includes planning, implementing and managing the Army physical fitness program; the conducting of an Army physical fitness test; physical fitness training to include conditioning, calisthenics, and cross-country running. Fundamentals of drills and ceremony will also be taught.
- 101 Special Topics** (Variable 0.0-6.0) This course is designed to give the department an opportunity to test a new course.
- 102 Basic Leadership Laboratory** (LAB 1.0) Hands-on experience in basic military leadership skills, supplementing, but not duplicating classroom instruction in MSI and MSII courses. Training is conducted at squad (8 person group) level with emphasis on leadership development at that level. Topics include oral communication and presentations, decision making, drill and ceremonies, squad tactics, land nav, and the tactical bivouac. Prerequisite: To accompany Mil Sc 40.
- 105 Adaptive Tactical Leadership** (LEC 2.0 and LAB 1.0) Challenges cadets to study, practice, and evaluate adaptive leadership skills as they are presented with scenarios related to squad operations. Cadets receive systematic and specific feedback on their leadership attributes and actions. Based on such feedback and self-evaluations, cadets continue to develop their leadership

and critical thinking abilities. Prerequisites: Mil Sc 15, 25, 35, 40 - Exceptions to be made by Dept Chair Only In Accordance with Army (Cadet Command) Policies.

- 106 Leadership in Changing Environments** (LEC 2.0 and LAB 1.0) Uses increasingly intense situational leadership challenges to build cadet awareness and skills in leading tactical operations up to platoon level. Cadets review aspects of combat, stability, and support operations. They also conduct military briefings and develop proficiency in garrison operation orders. Prerequisites: Mil Sc 105 - Exceptions to be made by Department Chair Only In Accordance With Army (Cadet Command) Policies.
- 200 Special Problems** (IND 0.0-6.0) Problems or readings on specific subjects or projects in the department. Consent of instructor required. Prerequisites: Mil Sc 207 and 208 - Exceptions to be made by Dept Chair Only in accordance with Army (Cadet Command) policies.
- 207 Developing Adaptive Leaders** (LEC 2.0 and LAB 1.0) Develops cadet proficiency in planning, executing, and assessing operations, functioning as a member of a staff, and providing performance feedback to subordinates. Cadets assess risk, make ethical decisions, and lead fellow ROTC cadets. Lessons on military justice and personnel processes prepare cadets to make the transition to Army officers. Prerequisites: Mil Sc 105 and 106 - Exceptions to be made by Dept Chair Only in accordance with Army (Cadet Command) policies.
- 208 Leadership in a Complex World** (LEC 2.0 and LAB 1.0) Explores the dynamics of leading current military operations in the contemporary operating environment. Cadets examine differences in customs, military law, principles of war, and rules of engagement in terrorism. They also explore aspects of interacting with non-government organizations, civilians on the battlefield, and host nation support. Prerequisite: Mil Sc 207 - Exceptions to be made by Department Chair Only In Accordance With Army (Cadet Command) Policies.

### Multiculturalism & Diversity Minor

The minor requires 15 hours in a minimum of 3 of the 4 Humanities and Social Sciences departments in the College of Arts and Sciences: Departments of Arts, Languages & Philosophy, History & Political Science, English and Technical Communication, and Psychology. Courses offered by these departments that can be included in the minor are listed.

#### Arts, Languages & Philosophy:

One 3rd level basic study course in a foreign language \*(German, Spanish, French or Russian), French 360, Philosophy 340, Russian 360, Speech 235.

#### English and Technical Communication:

English 102, English 215, English 230, English 378.

#### History and Political Science:

History 226, History 355, History 360, Political Science 226, Political Science 350.

**Psychology:**

Psychology 350, Psychology 380.

\*Specific 3rd Level Language Courses

French 80, 90, 110, 170, 180, 311, 370, & 375

German 70, 90, 110, 170, 180, 311, 370, 375, & 385

Russian 80, 110, 170, 180, 311, 370, & 375

Spanish 80, 90, 110, 160, 170, 180, 311, 377, & 378

## Music

At UMR, music offerings include bands, orchestras, choirs, and the Collegium Musicum. Credit may be earned by participating in these groups.

You can take courses in various areas of music appreciation, music history and theory, special projects courses in music, and private applied music instruction.

The music minor is available and you may elect this as a broadening aspect to your education.

### Faculty

**Professor:**

David Oakley (Emeritus), D.M.E., Indiana

**Assistant Professor:**

Joel Kramme, (Emeritus) M.A., Iowa

Donald Miller, Ph.D., Iowa

**Lecturer:**

Lorie Francis, M.M., Colorado

### Music Minor Curriculum

- 1) The following courses will be taken:
  - A) Eight hours of theory.
  - B) Six hours of music history and literature.
  - C) Six hours of applied private instruction (two years), culminating in an approved recital or other appearance.
- 2) The successful music minor will demonstrate adequate keyboard proficiency or take keyboard until proficiency is attained.
- 3) The music minor will participate in one or more major ensembles per semester (band, jazz, orchestra, vocal, opera).

### Music Courses

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| <p>11 <b>Individual Music Instruction I</b> (LAB 1.0-2.0) Individual music instruction in student's concentration area. Consent of instructor required.</p> <p>21 <b>Individual Music Instruction II</b> (LAB 1.0-2.0) Individual music instruction in student's concentration area. Prerequisite: Consent of instructor.</p> <p>30 <b>University Band</b> (LAB 2.0) Open to all students who play a band instrument. This ensemble is both the "Miner" Marching Band and the UMR Symphonic Band. Students assigned to the ensemble after satisfactory audition.</p> <p>31 <b>Varsity Band</b> (LAB 1.0) A pops band for performance at basketball games and other campus functions; each semester. A skills course not a humanities elective. Consent of director.</p> | <p>32 <b>University Orchestra</b> (LAB 2.0) Open to all students who play stringed, wind, percussion or keyboard instruments used in the symphony orchestra. Students assigned to the orchestra after satisfactory audition.</p> <p>33 <b>Highland Pipe Band</b> (LAB 1.0) A musical unit of bagpipes and drums for performance at campus, military, and other functions. An elective not to satisfy humanities elective. Consent of instructor required.</p> <p>34 <b>Instrumental Chamber Ensemble-Strings</b> (LAB 1.0) Open to all students who play violin, viola, cello or double bass. Students assigned to the ensemble after satisfactory audition.</p> <p>35 <b>Wind And Percussion Ensemble</b> (LAB 1.0) Open to all students who play wind or percussion instruments.</p> <p>36 <b>Jazz Ensemble</b> (LAB 1.0) A study of the various instrumental jazz forms. Students are assigned by audition to a jazz ensemble.</p> <p>38 <b>Class Instrument Instruction</b> (LAB 0.5) Class instruction for students who play an instrument and wish to learn a secondary instrument or for students with no instrumental experience who wish to learn to play an instrument for self-betterment.</p> <p>40 <b>University Choir</b> (LAB 1.0) Open to any student of the university. Students assigned after satisfactory audition.</p> <p>41 <b>Chamber Vocal Ensembles</b> (LAB 1.0) The members are selected by audition and organized into interest groups-madrigal, pops ensemble, and chamber choir.</p> <p>42 <b>Collegium Musicum - King'S Musicke</b> (LAB 1.0) Study and performance of renaissance and early Baroque instrumental music using historical reproductions of period instruments and appropriate performance techniques. Performances on and off campus each semester. A skills course, not a humanities elective. Prerequisite: Consent of instructor and audition.</p> <p>43 <b>Collegium Musicum - Madrigal Singers</b> (LAB 1.0) Study and performance of renaissance and early Baroque vocal music using performance techniques appropriate to the period. Performances on and off campus each semester. A skills course, not a humanities elective. Prerequisite: Consent of instructor and audition.</p> <p>50 <b>Music Understanding And Appreciation</b> (LEC 3.0) A study of the development of music with emphasis on understanding music forms and the role music has played in the various historical periods.</p> <p>61 <b>Fundamentals Of Music</b> (LEC 2.0) A study of basic concepts in music, including pitch, notation beat, scales, intervals, and chords.</p> <p>100 <b>Special Problems</b> (IND 0.0-6.0) Problems or readings on specific subjects or projects in the department. Consent of instructor required.</p> <p>101 <b>Special Topics</b> (Variable 0.0-6.0) This course is designed to give the department an opportunity to test a new course. Variable title.</p> |
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- 111 Individual Music Instruction III** (LAB 1.0-2.0) Individual music instruction in student's concentration area. Prerequisite: Consent of instructor.
- 121 Individual Music Instruction IV** (LAB 1.0-2.0) Individual music instruction in student's concentration area. Prerequisite: Consent of instructor.
- 152 Survey Of Contemporary Music** (LEC 3.0) A study of the various musical developments in the 20th century, including electronic music. Includes in-depth analysis of form in music. Prerequisite: Music 50.
- 155 Music In The United States** (LEC 3.0) A study of the development of music in the United States from Colonial times to the present. Includes in-depth analysis of form in music. Prerequisite: Music 50.
- 161 Theory Of Music I** (LEC 3.0 and LAB 1.0) Basic musicianship. Notation, rhythm, meter, scales, intervals, triads, nonharmonic tones, major-minor seventh, modulations of common practice period. Strong emphasis on aural perception, sight-singing, and key-board performance of these materials. Applications of these materials in original composition and analysis of melodies and elementary homophonic form.
- 162 Theory Of Music II** (LEC 3.0 and LAB 1.0) A continuation of the requisite theory and fundamentals of music I. Prerequisite: Music 161.
- 171 Introduction To Electronic Music** (LEC 3.0) An introduction to the techniques, repertoire, history and literature of music technology and electronic music. Prerequisite: Music 161.
- 200 Special Problems** (IND 0.0-6.0) Problems or readings on specific subjects or projects in the department. Consent of instructor required.
- 201 Special Topics** (Variable 0.0-6.0) This course is designed to give the department an opportunity to test a new course. Variable title.
- 210 Seminar** (IND 0.0-6.0) Discussion of current topics.
- 251 History And Analysis Of Music I** (LEC 3.0) General survey of history of music from Greek period to 18th century. Score reading required. Prerequisite: Music 162.
- 252 History And Analysis Of Music II** (LEC 3.0) General survey of history of music from the 18th century to the present. Score reading required. Prerequisite: Music 251.
- 255 Music For The Elementary Teacher** (LEC 3.0) Pragmatic approaches in the development of concepts, knowledge and skills essential for music instruction within the elementary school curriculum. Offered on demand. Prerequisite: Instructor consent.
- 300 Special Problems** (IND 0.0-6.0) Problems or readings on specific subjects or projects in the department. Consent of instructor required.
- 301 Special Topics** (Variable 0.0-6.0) This course is designed to give the department an opportunity to test a new course. Variable title.
- 310 Symphonic Bands** (LAB 1.0) An auditioned ensemble. Students perform music for wind ensemble

and large bands. Music from 1400-present is performed in a concert setting. Prerequisite: Consent of instructor - audition only.

## Philosophy

### Bachelor of Arts

The Philosophy program is offered in the Department of Arts, Languages & Philosophy.

The study of philosophy emphasizes the understanding of ideas, the capacity to identify assumptions, and the ability to gain insights into problems and puzzles. Central to philosophy is the application of rigorous thinking to the fundamental issues of reality, knowledge, and value.

Because rigorous thinking is not restricted to any one academic area, philosophical interests are wide ranging. All types of questions are considered: do we have freewill or are all our actions caused? Does God exist and have a determinable nature? How do we tell the difference between what's morally right and wrong? What is thinking and can animals or machines think? How does our nature influence our behavior and creative activity? What is the interrelationship between technological development and human values? etc.

Philosophy touches on nearly all fields of endeavor and a philosophical education is very flexible. With the help of advisors, students can design their curriculum to match their own special interests. Philosophy is also an excellent pre-professional degree.

### Faculty

#### Professors:

Wayne Cogell (Emeritus), Ph.D., University of Missouri-Columbia

Richard Miller (Department Chair), Ph.D., Illinois

Robert Oakes (Emeritus), Ph.D., Pennsylvania

#### Associate Professor:

Carol Ann Smith (Emeritus), Ph.D., Pittsburgh

#### Assistant Professor:

Adam Potthast, Ph.D., University of Connecticut

#### Lecturer:

Darin Finke, M.A., University of Missouri-Columbia

### Bachelor of Arts

#### Philosophy

Guidelines for a major in philosophy are as follows:

- 1) Completion of general UMR B.A. requirements.
- 2) Phil 005, Introduction to Philosophy, and Phil 015, Introduction to Logic.
- 3) A minimum of 24 hours in philosophy beyond courses Phil 005 and 015, at least 12 of which must be at the 300 level. Courses to be taken should be determined in consultation with the student's major advisor.

An individualized program of study will be designed in conference between student and advisor in order to best serve student interests and needs.

**NOTE:** Entering students will normally take English 20 either semester of the first year.

## Philosophy Minor Curriculum

- 1) A student with a minor in philosophy must meet the following requirements:
  - A) Twelve hours in philosophy course beyond Phil 005, Introduction to Philosophy (Phil 005 is a prerequisite to a minor in philosophy).
  - B) Six of the twelve hours must be completed in philosophy courses numbered 300 or above.
- 2) A student should declare his or her intention to minor in philosophy by his or her junior year.
- 3) A member of the philosophy staff will act as the student's minor advisor. The student and his or her minor advisor will plan a course of study to meet the specific interests and needs of the student.

## Philosophy Courses

- 5 **Introduction To Philosophy** (LEC 3.0) An historical survey of the major approaches to philosophical problems, especially those of the nature of reality, human nature, and conduct. Prerequisite: Entrance requirements.
- 10 **Practical Reasoning** (LEC 3.0) An introduction to the study of non-formal reasoning. The course examines the subtle ways that the form in which information is presented can color the way that information is understood. Prerequisite: Entrance requirements.
- 15 **Introduction To Logic** (LEC 3.0) A study of the basic rules of both formal and symbolic logic, including types of argumentation, methods of reasoning, valid reasoning, inductive and deductive reasoning as used in the sciences and in communication in general. Prerequisite: Entrance requirements.
- 75 **Comparative Religious Philosophy** (LEC 3.0) A comparison of the philosophic ideas and foundations of the major Eastern and Western religions. Prerequisite: Entrance requirements.
- 100 **Special Problems** (IND 0.0-6.0) Problems or readings on specific subjects or projects in the department. Consent of instructor required.
- 101 **Special Topics** (Variable 0.0-6.0) This course is designed to give the department an opportunity to test a new course. Variable title.
- 200 **Special Problems** (IND 0.0-6.0) Problems or readings on specific subjects or projects in the department. Consent of instructor required.
- 201 **Special Topics** (Variable 0.0-6.0) This course is designed to give the department an opportunity to test a new course. Variable title.
- 204 **History Of Philosophy I** (LEC 3.0) A study of selected philosophical works from the pre-Socratics to William of Occam. Prerequisite: An introductory (below 100) level Philosophy course.
- 205 **History Of Philosophy II** (LEC 3.0) A study of selected philosophical works from Descartes to Hegel to Kant emphasizing the problems of knowledge and reality. Prerequisite: An introductory (below 100) level Philosophy course.
- 212 **Ethics Of Computer Usage** (LEC 3.0) After providing a brief background in ethical theory, this course will focus on five areas where use of computers has posed significant ethical questions: professional ethics, liability for malfunctions in computer programs, privacy, power, and ownership of computer programs. Prerequisite: Any introductory (below 100) level philosophy course.
- 225 **Engineering Ethics** (LEC 3.0) Engineering ethics, examines major ethical issues facing engineers in the practice of their profession: the problem of professionalism and a code of ethics; the process of ethical decision-making in different working environments; the rights, duties, and conflicting responsibilities of engineers. Prerequisite: An introductory (below 100) level philosophy course.
- 235 **Business Ethics** (LEC 3.0) Develop ethical concepts relevant to deciding the moral issues that arise in business. Topics include: Economic systems, government regulations, relations to external groups and environment, advertising, product safety and liability, worker safety and rights, rights and responsibilities of business professionals. Prerequisite: An introductory (below 100) level philosophy course.
- 300 **Special Problems** (IND 0.0-6.0) Problems or readings on specific subjects of projects in the department. Consent of instructor required.
- 301 **Special Topics** (Variable 0.0-6.0) This course is designed to give the department an opportunity to test a new course. Variable title.
- 302 **Internship-Philosophy** (IND 0.0-6.0) Internship will involve students applying critical thinking skills and discipline specific knowledge in a work setting based on a project designed by the advisor and employee. Activities will vary depending on the student's background and the setting. Prerequisites: Any introductory (below 100) level philosophy course.
- 305 **Contemporary Philosophy** (LEC 3.0) An examination of major philosophic movements of the 20th century such as Realism, Pragmatism, Logical Positivism, and Existentialism. Prerequisite: An introductory (below 100) level Philosophy course.
- 320 **Minds And Machines** (LEC 3.0) The course will be centered on the topic of artificial intelligence and the problems raised by contemporary attempts to simulate human thinking and perception in machines. Special emphasis will be placed on recent developments in psychology, physiology, cybernetics and computer technology. Prerequisite: Any introductory (below 100) level philosophy course.
- 325 **Philosophical Ideas In Literature** (LEC 3.0) A systematic study of philosophical problems which appear in literature, with illustrations from selected literary works. Prerequisite: Any introductory (below 100) level philosophy course.
- 330 **Philosophy Of Art: Aesthetics** (LEC 3.0) An examination of various theories of aesthetic value and the status of aesthetic judgments. Prerequisite:



site: An introductory (below 100) level Philosophy course.

- 333 American Philosophy** (LEC 3.0) A study of American philosophical development with emphasis upon the "Classical Age of American Philosophy", i.e., Pierce, James, Dewey, Royce, Santayana and Whitehead. Prerequisite: An introductory (below 100) level Philosophy course.
- 335 Philosophy Of Religion** (LEC 3.0) A consideration of the major presuppositions of western theism, such as the existence of god and the cognitive meaningfulness of religious language. Prerequisite: Any introductory (below 100) level philosophy course.
- 337 Existentialism** (LEC 3.0) A study of the origin, nature and implications of modern existentialism; selections from major existentialists are read. Prerequisite: An introductory (below 100) level Philosophy course.
- 340 Social Ethics** (LEC 3.0) Discussion of ethical issues confronting society and the arguments offered for alternative laws and public policies. Topics might include: freedom of speech/action, government regulation, welfare, capital punishment, euthanasia, abortion, the environment, affirmative action, just wars, foreign aid, world hunger. Prerequisite: Any lower level ethics course.
- 345 Philosophy Of Science** (LEC 3.0) An examination of the fundamental methods and assumptions of the sciences, with emphasis on scientific reasoning and theories. Prerequisite: Any introductory (below 100) level philosophy course.
- 347 Philosophy Of Language** (LEC 3.0) A study of the contemporary philosophical school of linguistic analysis. Topics will include theories of meaning, reference, the analysis of linguistic acts, the relation of language to thought and the world, the thesis of linguistic relativity (Whorf hypothesis), current theories in psycholinguistics. Prerequisite: Any introductory (below 100) level philosophy course.
- 350 Environmental Ethics** (LEC 3.0) Study of the complex moral issues concerning our relationship to the environment and the ethical foundations of our environmental responsibilities. Discussion topics include: conservation, preservation, resource development, pollution, toxic substances, future generations, endangered species, regulation, zoning, takings, etc. Prerequisite: Any introductory (below 100) level philosophy course.
- 354 Mathematical Logic I** (LEC 3.0) A mathematical introduction to logic with some applications. Functional and relational languages, satisfaction, soundness and completeness theorems, compactness theorems. Examples from Mathematics, Philosophy and/or Computer Science. Prerequisite: Philos 15 with junior standing or Math 305 or Comp Sci 253. (Co-listed with Math 354 and Comp Sci 354)
- 360 Foundations Of Political Conflict** (LEC 3.0) This course is designed as a survey of the philosophical foundation of major political systems. For

example, communism, fascism, democracy. Materials will be drawn from relevant historical and/or contemporary sources. Prerequisite: Any introductory (below 100) level Philosophy course.

- 368 Law and Ethics in E-Commerce** (LEC 3.0) Provides the ethical framework to analyze the ethical, legal, and social issues that arise for citizens and computer professionals regarding the computerization of society. Topics include: free speech, privacy, intellectual property, product liability, and professional responsibility. Prerequisite: Any intro level Philosophy course. (Co-listed with IST 368)
- 399 Topics In Philosophy** (LEC 3.0) An intensive course designed for students with a special interest in philosophy. The content of the course may vary and the course may be repeated for additional credit. Prerequisite: An introductory (below 100) level Philosophy course.

## Physical Education and Recreation

To enhance your academic education, you can take part in physical education and recreation courses on campus. There are courses in aerobics, aquatics, golf, racquetball, swimming fitness, tennis, methods in elementary physical education, weight training, theory of coaching basketball and football, care and prevention of athletic injuries, elements of health education, and theory of sports officiating. The goal of the department is to provide recreational experiences and course work, which will contribute to your physical health and development, social adjustment, and emotional well being. The emphasis is on training you to gain the maximum benefit from leisure time both now and in the future.

The Multi-Purpose Building, Student Rec Center, and surrounding facilities provide an ideal place for you to participate in recreational activities. The building features an indoor swimming pool, indoor jogging track, basketball, volleyball, and badminton courts, weight rooms, aerobics/martial arts room, racquetball courts and a squash court. A golf course, tennis courts, and multi-use intramural fields highlight the outdoor facilities.

### Faculty

#### Professors:

Dewey Allgood (Emeritus), M.A., Colorado State  
Billy Key (Emeritus), M.S., Washington University

#### Instructors:

Ryan Anderson, B.S., University of Nebraska-Kearney  
Travis Boulware, M.S., Tennessee Tech University  
Kirby Cannon, M.S., Iowa State  
Vince Darnell, B.S., Columbia College  
Todd Degraffenreid, M.Ed., William Woods  
Alan Eads, M.S., Univ. of Missouri - Columbia  
L. Douglas Grooms, B.S.E., Northeast Missouri  
Jon Kiester, B.A., Hawaii Pacific University  
Marc Kolb, B.A., Brown University

## 102 — Physics

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Erik Kruppe, M.A., Northeastern Illinois University  
Dale Martin, M.S., Central Missouri  
Sterling Martin, B.S., Drake  
Sarah Moore (Department Chair), M.S., University of Tennessee  
Mark Mullin (Athletic Director), M.S., Northeast Missouri  
Marcus Payne, B.S., Southwestern College  
Bryan Schiding, M.B.A., LaSalle

### Physical Education Courses

- 100 Special Problems** (IND 0.0-6.0) Problems or readings on specific subjects or projects in the department. Consent of instructor required.
- 101 Special Topics** (Variable 0.0-6.0) This course is designed to give the department an opportunity to test a new course. Variable title.
- 102 Fundamentals Of Golf** (LAB 1.0) To give the student the theory and practical application of the golf swing while at the same time developing increasing skills, and an interest in the history, rules, and etiquette of the game of golf.
- 103 Fundamentals Of Tennis** (LAB 1.0) Lectures, demonstration, and supervised practice are designed to acquaint the student participants with theory and execution which govern the playing of sound and effective tennis.
- 104 Beginning Aquatics** (LAB 1.0) The course will provide the student with basic swimming, diving, and elementary life saving skills to prepare the student for additional work in the field of aquatics.
- 105 Aerobics** (LAB 1.0) The course intent is to improve the physical condition of the student through various mediums of exercise aimed at demanding more oxygen over an extended period of time to increase the efficiency of the cardio-vascular system and improve muscle tone.
- 108 Beginning Racquetball** (LAB 1.0) Course instruction familiarizes the student with the rules, playing strategy, and court etiquette of racquetball. Actual playing experience allows the opportunity for skill development in this leisure activity.
- 109 Basketball/Volleyball** (LAB 1.0) The Basketball/Volleyball course will contribute to the mastery of fundamental skills in two of the world's leading participation sports. History, rules and strategy will be emphasized.
- 110 Weight Training** (LAB 1.0) Course instruction emphasizes the cognitive aspects of weight lifting, covering such topics as motivation, common injuries, procedures for warm-up and cool down, and safety procedures.
- 111 Swimming Fitness** (LAB 1.0) The Swimming Fitness course will provide an environment which will be conducive for the student to improve physical skills and conditioning through training in the water. Benefits of exercise, training principles and safety precautions will be emphasized.
- 112 Fundamentals And Theory Of Coaching Basketball** (LEC 2.0) To make the student aware of skills, fundamentals, court situations, strategy, and administrative procedures for successful basketball coaching.
- 113 Fundamentals And Theory Of Coaching Football** (LEC 2.0) To present materials that will provide the student with a working knowledge of coaching, administration, and appreciation of football.
- 150 Administration Of Interscholastic Athletics** (LEC 3.0) To present materials that will provide the student with a working knowledge of the major administration and day to day problems that are associated with interscholastic athletics.
- 151 Care And Prevention Of Athletic Injuries** (LEC 3.0) Technique, principles, and theory underlying the prevention and care of athletic injuries.
- 152 Elements Of Health Education** (LEC 2.0) This course surveys various health topics and attempts to provide some answers related to them. Presents pertinent scientific and medical facts of current health concepts and their relation to the principles and theories of health education.
- 153 Fundamentals And Theory Of Sports Officiating** (LEC 2.0) To prepare students with knowledge and skills so that they may both officiate competently and adequately critique officiating by others.
- 200 Special Problems** (IND 0.0-6.0) Problems or readings on specific subjects or projects in the department. Consent of instructor required.
- 201 Special Topics** (Variable 0.0-6.0) This course is designed to give the department an opportunity to test a new course. Variable title.
- 230 Methods In Physical Education K-4** (LEC 3.0) The course will provide the opportunity to learn how to promote student fitness and skill development while building the foundation for a physically active life through specific activities aimed at the younger child. (Co-listed with Educ 230)
- 231 Methods In Physical Education 5-9** (LEC 3.0) The course will provide the opportunity to learn how to promote student fitness and skill development while building the foundation for a physically active life through specific activities aimed at the student in transition from childhood to young adulthood (5-9). (Co-listed with Educ 231)

## Physics

Bachelor of Science

Master of Science

Master of Science for Teachers

Doctor of Philosophy

Physics is devoted to the discovery and exploration of the most basic physical laws governing our material universe. The working physicist attempts to express these laws in their most elegant mathematical form, so that they can be applied to predict the behavior of all forms of matter and energy, in physical systems that range from the subatomic level of quarks, gluons, nuclei, and atoms, all the way out to the astrophysical level of planets, stars, black holes, galaxies, and larger

scale structures of the universe. The knowledge obtained in various experimental and theoretical investigations of physical phenomena forms the foundation for many modern technologies. From the lasers used in high-speed communications and micro-surgery, to the plastic electronics used in modern computer displays, the magnetic behavior of the thin films used for computer hard drives, and the radiation detectors and optical elements used in the Hubble space telescope, the fundamental knowledge gained by physicists helps to shape and improve the quality of modern life.

The UMR physics department is dedicated to providing opportunities for undergraduates to participate in cutting-edge, nationally funded scientific research programs supervised by departmental faculty. Topics currently being investigated by UMR undergraduates include collisions between electrons, atoms, and ions; the magnetic properties of nanoscale thin films and other highly magnetic materials; exotic interactions in atoms and molecules excited with ultrafast lasers; electrically generated luminescence in polymers; and atmospheric changes induced by manmade pollutants, such as those found in acid rain or in the exhaust generated by high altitude aircraft and space vehicle launches.

The department encourages its undergraduates to get involved in the many research projects available, and many students who participate in research go on to present their work at research competitions throughout the state and at national scientific meetings. UMR physics students regularly win prizes for their research accomplishments in the annual Fuller and Missouri Academy of Science competitions.

After receiving a solid foundation in the basic physics governing the behavior of matter, energy, and radiation, the undergraduate physics major is able to choose among many advanced level courses to satisfy their particular interests in various fields of modern physics. Courses available to upper level physics majors include advanced electricity and magnetism, classical and modern optics, astrophysics, physical mechanics, cloud and aerosol physics, quantum mechanics, general relativity, thermal physics, solid state physics, and laser physics. The curriculum also includes advanced laboratory courses where students design and participate in original research with other enthusiastic physics majors. Many additional technical courses are available to physics majors in applied areas of other disciplines, such as computer science, electrical engineering, and the biological sciences.

Your undergraduate program will cover a range of fundamental topics and will include substantial laboratory training. In addition, the program is designed with many electives that allow physics majors to tailor their undergraduate education to their own particular interests. As a physics major you will have the flexibility to develop a program that best suits your interest and needs. With 50 credit hours in physics, 23 in mathematics, 9 in chemistry, and 3 in computer science, the rest of the 128 required hours are in electives that you select in consultation with your advisor.

Many physics majors choose to use their electives to study other technical areas, such as mathematics,

computer science, or electrical engineering. Some students get dual bachelor's degrees, for example, with their second degree in computer science, chemistry, or mathematics. Because there is considerable overlap in degree requirements between physics and other technical and scientific disciplines, a dual degree usually requires no more than one extra semester of undergraduate study. The best curriculum for each student seeking a dual degree is determined in planning sessions with his or her advisor.

An undergraduate degree in physics provides opportunities for a wide range of careers. Over two-thirds of our graduates go on to graduate school, many at some of the most prestigious first-tier schools in the country. Those who complete their physics education with a bachelor's degree have been very successful in finding exciting employment opportunities in today's high-tech industries. UMR physics graduates have gone on to lead and manage major research efforts at leading industrial companies, to be professors and chairmen at leading academic universities, and to work in areas ranging from law and medicine to ecophysics and astrophysics.

All interested or prospective students considering a career in physics are invited to visit the campus and tour our research laboratories and classrooms to obtain a better picture of the exciting opportunities available.

## Faculty

### Professors:

Ralph Alexander, Jr., Ph.D., Cornell  
 Robert Dubois, Ph.D., Nebraska  
 Don Hagen, Ph.D., Purdue  
 Barbara Hale, Ph.D., Purdue  
 Don Madison (Curators'), Ph.D., Florida State  
 Ronald Olson (Curators'), Ph.D., Purdue  
 Paul Parris (Department Chair), Ph.D., Rochester  
 Jerry Peacher, Ph.D., Indiana  
 Allan Pringle, Ph.D., University of Missouri-Columbia  
 Michael Schulz, Ph.D., Heidelberg  
 Dan Waddill, Ph.D., Indiana  
 Gerald Wilemski, Ph.D., Yale

### Associate Professors:

Ronald Bieniek, Ph.D., Harvard  
 John Schmitt, Ph.D., Michigan  
 Greg Story, Ph.D., Southern California

### Assistant Professors:

Massimo Bertino, Ph.D., Göttingen  
 Julia Medvedeva, Ph.D., Russian Acad. of Science  
 Thomas Vojta, Ph.D., Chemnitz

### Research Assistant Professor:

Alexey Yamilov, Ph.D., CUNY

### Adjunct Assistant Professor:

Agnes Vojta, Ph.D., Technische Universitaet Dresden

## Emeritus:

### Professors:

Ibrahim Adawi (Emeritus), Ph.D., Cornell  
 Robert Bell (Emeritus), Ph.D., Virginia Polytechnic Institute  
 John Carstens (Emeritus), Ph.D., University of Missouri-Rolla

## 104 — Physics

Robert Gerson (Emeritus), Ph.D., New York  
 Edward Hale (Emeritus), Ph.D., Purdue  
 Otto Hill (Emeritus), Ph.D., Texas  
 Robert McFarland (Emeritus), Ph.D., Wisconsin  
 John Park (Emeritus), Ph.D., Nebraska  
 Don Sparlin (Emeritus), Ph.D., Northwestern

### Associate Professors:

Charles McFarland (Emeritus), Ph.D., Washington University  
 William Parks (Emeritus), Ph.D., Iowa

## Bachelor of Science Physics

### FRESHMAN YEAR

	Credit
First Semester	
Chem 1-General Chemistry	.4
Chem 2-General Chemistry	.1
Chem 4-Intro to Lab Safety & Hazardous Materials	.1
English 20-Exposition & Argumentation	.3
Math 8-Calculus w/Analytic Geometry I	.5
Physics 1-Intro to Physics	<u>.1</u>
	15

### Second Semester

Chem 3-General Chemistry	.3
History (112, 175, 176) or Pol Sc 90	.3
Math 21-Calculus w/Analytic Geometry II	.5
Physics 21-General Physics 1	.4
Physics 22 or 27-General Physics Lab	<u>.1</u>
	16

### SOPHOMORE YEAR

	Credit
First Semester	
English 60-Writing & Research	.3
Math 22-Calculus w/Analytic Geometry III	.4
Physics 25-General Physics II	.4
Physics 26 or 28-General Physics Lab	.1
Cmp Sc 73 & 77 or 74 & 78 or 53	.3
Elective <sup>1</sup>	<u>.3</u>
	18

### Second Semester

Math 204-Elementary Differential Equations	.3
Physics 207-Modern Physics I	.3
Physics 212-Intermediate Physics Lab	.3
Physics 208-Intro to Theoretical Physics	.3
Elective <sup>1</sup>	<u>.3</u>
	15

### JUNIOR YEAR

	Credit
First Semester	
Physics 308-Physical Mechanics	.3
Physics 322-Advanced Physics Lab I	.3
Physics 307-Modern Physics II	.3
Math/Stat Elective <sup>2</sup>	.3
Electives <sup>1</sup>	<u>.6</u>
	18

### Second Semester

Physics 221-Electricity & Magnetism I	.3
Physics 332-Advanced Physics Lab II	.3
Math/Stat Elective <sup>2</sup>	.3
Electives <sup>1</sup>	<u>.7</u>
	16

### SENIOR YEAR

	Credit
First Semester	
Physics 321-Electricity & Magnetism II	.3
Physics 361-Intro to Quantum Mechanics	.3
Physics Elective <sup>3</sup>	.3
Electives <sup>1</sup>	<u>.6</u>
	15
Second Semester	
Physics 311-Thermal Physics	.3
Elective-Humanities (300 level) <sup>1</sup>	.3
Physics Elective <sup>3</sup>	.3
Electives <sup>1</sup>	<u>.6</u>
	15

**NOTE:** The minimum credit hours required for a Bachelor of Science in Physics is 128 hours. No more than two of the required physics and mathematics courses with a grade of "D" may be used to meet graduation requirements. Upon petition to and approval by the physics faculty, three semester hours of advanced ROTC (Military Science or Aerospace Credit Studies) credit can be counted as elective credit to meet requirements for graduation.

<sup>1</sup> Electives, in addition to the Math/Stat electives<sup>2</sup> and Physics electives<sup>3</sup>, shall include six hours of social studies and nine hours of humanities, at least three of which must be literature and at least three of which must be at the 300 level (Phil 345 recommended). Twenty-one hours of free electives may be used to develop an emphasis area. Eighteen hours of elective credit shall be in courses at the junior or senior level.

<sup>2</sup> Six hours of mathematics or statistics beyond Math 204 are required. Math 208, 322, 325, or 351 are recommended.

<sup>3</sup> In addition to the specific physics courses listed (Physics 307, 308, 311, 321,322,332, and 361) two other physics 300 level courses are required. Physics 305, 323, 337, 357, 371, or 381 are recommended.

Students who are pursuing teaching certification through the UMR Teacher Education Program along with their Bachelor of Science in Physics may substitute 15 credit hours of Professional Requirements in Education for six hours of mathematics electives, six hours of physics electives, and three hours of computer science courses. These students may also substitute Physics 23 and 24 for Physics 21, 22, 25, and 26, and Math 14 and 15 for Math 8 and 21.

## Physics Minor Curriculum

The minor in physics is a flexible program whose goal is to increase the breadth and competency of science and engineering students in modern or classical physics. Science students pursuing the physics minor will be interested in a deeper understanding of fundamental physical processes. Engineering students who intend to work in research or advanced development may use a physics minor to acquire a thorough knowledge of classical and quantum optics or laser processes.

The physics minor consists of Physics 107 or Physics 207 and 12 additional hours of physics courses at the 200 level or above. The program will be designed to conform to the individual's interests and needs.

## Physics Courses

- 1 **Introduction To Physics** (LEC 1.0) An introduction to the study of physics and its intellectual and professional opportunities. The student will be acquainted with the various areas of physics and with departmental and campus facilities useful to their future studies. Required of all freshman majors.
- 4 **Concepts In Physics** (LEC 3.0) A non-mathematical description of the evolution and current status of the basic laws of physics, intended for non-science majors. Mechanics, relativity, thermodynamics, electromagnetics, and quantum physics are studies.
- 5 **Concepts In Physics Laboratory** (LAB 1.0) A series of elementary experiments, five required, sixth optional, will be used to illustrate such basic concepts of physics as conservation of energy and momentum, interference of light, atomic spectra, etc. Prerequisite: Preceded or accompanied by Physics 4.
- 6 **Environmental Physics I** (LEC 3.0) A course for non-science majors which will consider, without mathematics, the production of energy and the environmental consequences of its use, and the physical problems associated with pollution.
- 7 **Environmental Physics II** (LEC 3.0) A companion course to Environmental Physics 1: A non-mathematical course treating problems of the environment: Population, limits to growth, world resources, conventional and alternative energy sources, atmospheric physics, land degradation, air and water pollution and control.
- 8 **Laboratory For Environmental Physics** (LAB 1.0) A laboratory course to accompany the Environmental Physics lecture course as an option. A set of experiments will be performed related to environmental impacts studied in Environmental Physics 006. To be taken simultaneously with Environmental Physics 006. Prerequisite: Corequisite Physics 6.
- 9 **Introductory Astronomy** (LEC 3.0) An introductory course in basic astronomy designed primarily for students other than those in science and engineering. Topics include history, the sky, the solar system, stars, stellar evolution, galaxies and the origin and evolution of the universe. Credit will not be given for both Physics 9 and Physics 11.
- 10 **Astronomy Laboratory** (LAB 1.0) A science laboratory course in which the student analyzes and interprets astronomical data and makes observations with a telescope. Prerequisite: Preceded or accompanied by Physics 9 or 11.
- 11 **Descriptive Astronomy** (LEC 3.0) A fundamental survey course in modern astronomy. Topics include: history, celestial mechanics, the earth and sky, time, the solar system, telescopes, stellar structure and evolution, black holes, neutron stars, the galaxy, galaxies, and the origin and structure of the universe. Credit will not be given for both Physics 9 and Physics 11.
- 21 **General Physics I** (LEC 4.0) An introduction to the fundamental ideas of physics, including mechanics, heat, and sound. Prerequisites: Preceded or accompanied by Math 8 or Math 14.
- 22 **General Physics Laboratory** (LAB 1.0) Experiments related to topics studied in Physics 21. Prerequisite: Preceded or accompanied by Physics 21.
- 23 **Engineering Physics I** (LEC 1.5, RSD 1.5, and LAB 1.0) An introduction to mechanics, with an emphasis on topics needed by engineering students, including kinematics, dynamics, statics, and energetics. Prerequisite: Math 8 or 14.
- 24 **Engineering Physics II** (LEC 1.5, RSD 1.5, and LAB 1.0) An introduction to electricity, magnetism, and light, with emphasis on topics needed by engineering students. Prerequisites: Physics 23, Math 21 or 15.
- 25 **General Physics II** (LEC 4.0) An introduction to the fundamental ideas of physics including electricity, magnetism, and light. Prerequisites: Preceded by Physics 21 and preceded or accompanied by Math 21 or Math 15.
- 26 **General Physics Laboratory** (LAB 1.0) Experiments related to topics studied in Physics 25. Prerequisite: Preceded or accompanied by Physics 25.
- 27 **General Physics Laboratory** (LAB 1.0) An enriched Physics 22 laboratory offered to superior students. Prerequisite: Preceded or accompanied by Physics 21 or 23.
- 28 **General Physics Laboratory** (LAB 1.0) An enriched Physics 26 laboratory offered to superior students. Prerequisite: Preceded or accompanied by Physics 24 or 25.
- 31 **College Physics I** (LEC 3.0) An introduction to the ideas of physics, including mechanics, heat, and sound. Prerequisites: Math 6 and either of Math 2 or Math 4.
- 35 **College Physics II** (LEC 3.0) An introduction to the ideas of physics, including electricity, magnetism, and light. Prerequisite: Math 6.
- 101 **Special Topics** (Variable 0.0-6.0) This course is designed to give the department an opportunity to test a new course. Variable title.
- 107 **Introduction To Modern Physics** (LEC 3.0) An elementary survey of the modern concepts in physics and their applications; relativity, quantum mechanics, atomic physics, solid state physics, nuclear and particle physics. Prerequisites: Math 22 and Physics 24 or 25.
- 201 **Special Topics** (Variable 0.0-6.0) This course is designed to give the department an opportunity to test a new course. Variable title.
- 207 **Modern Physics I** (LEC 3.0) An introduction to quantum mechanics, atomic physics, and solid state physics. Topics include historically important experiments and interpretations. Prerequisites: Physics 24 or 25, preceded or accompanied by Math 204 or 229.

- 208 Introduction To Theoretical Physics** (LEC 3.0) Fundamental physical concepts are elaborated in mathematical terms emphasizing the coherence and economy of Physics. Topics include elementary vector analysis, introduction to physical mechanics (motion of a point mass, conservation laws, relativity), Fourier series, and introduction to partial differential equations. Prerequisites: Math 204 co-requisite; Physics 24 or 25.
- 212 Intermediate Physics Laboratory** (LEC 1.0 and LAB 2.0) A laboratory study of the principles of instrumentation used in all modern branches of physics. Analog and digital methods of data gathering are surveyed. Laboratory practice evolves from elementary operations to the design and assembly of a simple instrument.
- 221 Electricity And Magnetism I** (LEC 3.0) A study of electric and magnetic fields, leading to Maxwell's equations. Topics covered include the electrostatic field, the electric potential, and the electrostatic field in matter. Prerequisite: Physics 208.
- 236 Basic Weather** (LEC 2.0 and LAB 1.0) A course to study basic concepts of atmospheric science such as air masses, frontal weather patterns and weather forecasting. The course also will include topics on climate and severe weather. Prerequisites: Physics 23, Ge Eng 50. (Co-listed with Ge Eng 236)
- 300 Special Problems** (IND 0.0-6.0) Problems or readings on specific subjects or projects in the department. Consent of instructor required.
- 301 Special Topics** (Variable 0.0-6.0) This course is designed to give the department an opportunity to test a new course. Variable title.
- 302 Physics For Elementary School Teachers** (LEC 2.0 and LAB 1.0) A nonmathematical review of the fundamental ideas of physics, including mechanics, matter, energy, sound, electricity, magnetism, astronomy, and light. Emphasis is placed on the development of hands-on activities. (For elementary school teachers or Master of Science for Teachers candidates only.)
- 303 Physics For Secondary School Teachers** (LEC 3.0) A review of the fundamental ideas of physics, including mechanics, matter, energy, sound, electricity, magnetism, and light with an emphasis on how mathematics can be used to help understand the underlying concepts. (For secondary teachers or Masters of Science Teachers candidates only.) Prerequisites: Math 22 and admission to the MST program.
- 305 Astrophysics** (LEC 3.0) The structure, physical characteristics and evolution of stars, binary systems, nebulae and galaxies. Prerequisite: Physics 107.
- 306 Physics, Energy, and the Environment** (LEC 3.0) Applications of physics to the environment, including energy, its conservation and transformation, environmental consequences of energy use; world energy resources; atmospheric physics; sources of air, water, and land pollution, and the role physics plays in controlling those resources. May not be used as a 300-level elective for a B.S. in Physics. Prerequisite: Admissions to the MST program.
- 307 Modern Physics II** (LEC 3.0) A continuation of Physics 207. An introduction to nuclear and particle physics. Topics include nuclear models, decays, and reactions, and elementary particles and fundamental forces. Prerequisites: Math 204 or 229, and either Physics 107 with consent of instructor or Physics 207.
- 308 Physical Mechanics** (LEC 3.0) This course covers topics of rigid body motion in three dimensions, moving coordinate frames, two body collisions, conservation laws, small oscillations, generalized coordinates, and LaGrange's and Hamilton's equations. Prerequisite: Physics 208.
- 309 Astrophysical Concepts** (LEC 3.0) A comprehensive course in modern astrophysics. Topics include: Earth and sky, planetary science, stellar structure and evolution, galaxies, and structure and evolution of the universe. The course includes hands-on computer simulation and telescope use. (For secondary teachers or Master of Science for Teachers candidates.) Prerequisite: Math 22 or admission to the MST program.
- 311 Thermal Physics** (LEC 3.0) A study of the equilibrium states of matter as governed by the first and second laws of thermodynamics. Emphasis is placed on the microscopic approach with an introduction to statistical mechanics. Topics include the kinetic theory of (uniform) gases, phase equilibria in pure systems, and an introduction to quantum statistics. Prerequisite: Physics 107 or 207.
- 313 Introduction To General Relativity** (LEC 3.0) An introduction to the theory of general relativity. Topics covered include the formalism of general relativity, Einstein's gravitational field equations, the Schwarzschild solution, black holes, and cosmological models of the universe. Prerequisite: Physics 208.
- 321 Electricity And Magnetism II** (LEC 3.0) A continuation of Physics 221. Topics covered include the magnetostatic field, the magnetic vector potential, the magnetostatic field in matter, electrodynamics, and electromagnetic waves. Prerequisite: Physics 221.
- 322 Advanced Physics Laboratory I** (LAB 3.0) A laboratory study of the principles of basic experiments in all major branches of physics. The experiments stress design of apparatus, and procedures and analysis in projects involving electronic, optical, mechanical, and vacuum techniques. Prerequisite: Physics 212.
- 323 Classical Optics** (LEC 3.0) Physical optics and advanced topics in geometrical optics. Topics include ray propagation, electromagnetic propagation, mirrors, lenses, interference, diffraction, polarization, imaging systems, and guided waves. Prerequisites: Math 22 and Physics 24 or 25. (Co-listed with EI Eng 323)

- 324 Fourier Optics** (LEC 3.0) Applications of Fourier analysis and linear system theory to optics. Topics include scalar diffraction theory, Fourier transforming properties of lenses, optical information processing, and imaging systems. Prerequisites: El Eng 261 & 275 or Physics 208 & 321. (Co-listed with El Eng 324)
- 326 Fiber And Integrated Optics** (LEC 3.0) Introduction to optical waveguides and their applications to communication and sensing. Topics include dielectric waveguide theory, optical fiber characteristics, integrated optic circuits, coupled-mode theory, optical communication systems, and photonic sensors. Prerequisite: El Eng 275 or Physics 321. (Co-listed with El Eng 326)
- 332 Advanced Physics Laboratory II** (LAB 3.0) A senior laboratory involving experimental design. The student must specify his objectives, assemble apparatus, take measurements, analyze the results, form conclusions, write a report, and deliver an oral presentation of the results. Prerequisite: Physics 212.
- 337 Atmospheric Science** (LEC 3.0) An introductory survey designed to acquaint engineering and science students with the fundamentals of Atmospheric Science. Topics include atmospheric thermodynamics, synoptic scale disturbances, atmospheric aerosols (including cloud and precipitation physics), atmospheric electricity, and radiative transfer. Prerequisites: Mc Eng 221 or 227, Ch Eng 141, or Chem 241, or Physics 311. (Co-listed with Mc Eng 337)
- 341 Contemporary Optics** (LEC 3.0) Basic optics techniques required in research or optical communication. Topics covered are basic geometric optics, commercial lens design programs, semiconductor lasers and LED's, modulation, optical detectors, fiber optics, optical communication systems, and other topics of interest. Prerequisite: Physics 24.
- 345 Acoustics** (LEC 3.0) Theory of oscillating mechanical systems, wave propagation, the production and transmission of sound, and ultrasonics. Prerequisites: Math 22 and Physics 24 or 25.
- 351 Computational Physics** (LEC 3.0 and LAB 1.0) An introduction to modern computer simulations for solving physics problems. The course will be project-oriented with examples including planetary motion, chaotic dynamics, quantum scattering, structure of atoms and clusters, molecular dynamics, and Monte-Carlo simulations. Prerequisites: Physics 107 or Physics 207; Math 204; programming experience.
- 355 Chaos, Fractals, and Nonlinear Dynamics** (LEC 3.0) An introduction into nonlinear dynamics, deterministic chaos, and fractals. Topics covered include phase plane analysis, iterated maps, routes to chaos, Lyapunov exponents, strange attractors and pattern formation with applications to chaotic vibrations, population dynamics, chemical oscillations and lasers. Prerequisites: Math 204; Physics 24 or Physics 25.
- 357 Subatomic Physics** (LEC 3.0) An introduction to elementary particles. Topics include particle properties, nuclear forces, particle interactions, the Standard Model for quarks and leptons, fundamental forces in gauge field theory models, and the role of elementary particle interactions in cosmology. Prerequisite: Physics 307.
- 361 Introduction To Quantum Mechanics** (LEC 3.0) The fundamental concepts, postulates and methods of quantum mechanics and their applications to physical systems. Topics include solutions of the Schrodinger equation for simple systems and operator methods. Prerequisites: Physics 107 or 207, 208.
- 367 Plasma Physics** (LEC 3.0) Single-particle motions, plasmas as fluids, waves, diffusion, equilibrium, stability, kinetic theory, nonlinear effects. Prerequisites: Math 204 and Physics 107 or 207 or Nu Eng 203.
- 371 Laser Physics** (LEC 3.0) The generation of coherent radiation by lasers and the interaction of laser radiation with matter. Topics include stimulated emission, population inversion, optical cavities, optical gain, properties of laser media and other applications. Prerequisite: Physics 107 or 207.
- 377 Principles Of Engineering Materials** (LEC 3.0) Examination of engineering materials with emphasis on selection and application of materials in industry. Particular attention is given to properties and applications of materials in extreme temperature and chemical environments. A discipline specific design project is required. (Not a technical elective for undergraduate metallurgy or ceramic majors) (Co-listed with Ae Eng 377, Ch Eng 347, Mt Eng 377, Cr Eng 377)
- 381 Elementary Solid State Physics** (LEC 3.0) An introductory study of the structure and physical Properties of crystalline solids. Included are topics in crystal structure, x-ray diffraction, crystal binding, thermal properties of solids, free electron theory and elementary energy band theory. Prerequisites: Math 204 and Physics 107 or 207.
- 390 Undergraduate Research** (IND 0.0-6.0) This course is designed for the undergraduate student who wishes to engage in research. It is not to be used for graduate credit nor for more than six credit hours of undergraduate credit. The subject and credit are to be arranged with the instructor.

## Political Science

Political Science explores the world of politics and the principles, techniques, and institutions through which we make collective decisions and resolve group conflicts. An understanding of politics is an especially useful skill for anyone entering a technical career, because so much of modern science and technology is embroiled in political controversy.

At UMR, courses are offered in American Politics, Comparative Politics, International Relations, and Political Theory. If you wish to pursue a specialized investigation of politics, a minor in political science is available.

## Faculty

### Associate Professors:

Tseggai Isaac, Ph.D., University of Missouri-Columbia  
Michael Meagher, Ph.D., Southern Illinois University

## Political Science Minor Curriculum

### (UMR)

The Department of History and Political Science offers a minor degree in political science which must include 15 hours divided as follows: completion of American Government (Pol Sc 90) and Theories and Issues of Political Science (Pol Sc 235), plus an approved sequence of 9 hours of 200 and 300 level courses.

## Science, Technology and Politics Minor

The Science, Technology and Politics (STP) minor is designed for students who want to explore the relationship between history, political science, and science and technology. The minor is particularly useful for technologically oriented students, because it provides insight into humanities and social science disciplines and how these disciplines interact with science and technology, thereby broadening their horizon of thought and action and preparing them for an increasingly technologically oriented future. To minor in STP the student must complete one of the following history survey courses: 111 or 112 or 175 or 176; and Political Science 90. After completing the required six hours, the student will select one of two options: The History of Science and Technology option; or the Politics and Public Policy option. Under the History of Science and Technology option, students will complete six additional hours from courses in history plus three hours in political science. Under the Politics and Public Policy option students will complete six additional hours in political science and three hours from history. The upper-level courses to satisfy degree requirements are as follows: HIST 270, 271, 274, 275, 280, or PHIL 345 and POL SC 237, 315, 317, and 325.

## Political Science Courses

- 90 American Government** (LEC 3.0) National, state and local government in the United States with special emphasis on political behavior and the institutions that determine and execute public policy. Topics include basic structure of American government, (i.e., democracy, the Constitution, the branches of government), as well as citizenship, parties, pressure groups and American economic policy. The course views government in its relation to its people, its services and protection.
- 100 Special Problems** (IND 0.0-6.0) Problems or readings on specific subjects or projects in the department. Consent of instructor required.
- 101 Special Topics** (Variable 0.0-6.0) This course is designed to give the department an opportunity to test a new course. Variable credit.
- 200 Special Problems** (IND 0.0-6.0) Problems or readings on specific subjects or projects in the department. Consent of instructor required.
- 201 Special Topics** (Variable 0.0-6.0) This course is designed to give the department an opportunity to test a new course. Variable title.
- 210 Seminar** (IND 0.0-6.0) Discussion of current topics.
- 225 Comparative Politics** (LEC 3.0) A comparative study of states, institutional structures, ideologies, political culture, political parties, interest groups and forms of government. How these social forces are organized to articulate national or parochial interests within the framework of participatory or centralized political systems will be studied. Prerequisite: Pol Sc 90 or Hist 175.
- 226 International Relations** (LEC 3.0) A general introduction to the theoretical framework, pattern and personalities of international relations with special emphasis upon American foreign policy making. Problems of international economic development, resources, and armaments will also be examined. Prerequisite: Pol Sc 90 or Hist 175 or 176.
- 235 Theories And Issues Of Political Science** (LEC 3.0) This course will introduce the student to the fundamental concepts and phenomena of political life and to the variety of political organizations characteristic of the modern age. Prerequisite: Pol Sc 90 or Hist 175 or 176.
- 237 Contemporary Political Thought** (LEC 3.0) This course will explore the impact of ideas on American politics and history, including the relationship between technological change and public policy; this will be pursued through the study of American political history, social institutions, and intellectual history. Prerequisite: Hist 175 or 176 or Pol Sc 90. (Co-listed with Hist 237)
- 250 State And Local Politics** (LEC 3.0) An examination of the political organizations, policies, and pressure at work in the sub-national level of American government. State, county, and city governments will be explored, along with the growing number of special land use boards, environmental protection commissions, etc. Prerequisite: Pol Sc 90, Hist 175 or 176.
- 290 American Political Parties** (LEC 3.0) The origin and development of political parties in the United States, the two-party system, the functions, organizations and operation of parties. Prerequisite: Pol Sc 90.
- 300 Special Problems And Readings** (IND 0.0-6.0) Problems or readings on specific subjects or projects in the department. Consent of instructor required.
- 301 Special Topics** (Variable 0.0-6.0) This course is designed to give the department an opportunity to test a new course. Variable title.



- 302 Political Science Internship** (IND 0.0-6.0) Internship will involve students applying critical thinking skills and discipline specific knowledge in a work setting based on a project designed by the advisor and employee. Activities will vary depending on the student's background and the setting. Prerequisite: Pol Sc 90 or Pol Sc 235.
- 310 Seminar** (RSD 0.0-6.0) Discussion of current topics Prerequisite: Senior standing.
- 315 Principles Of Public Policy** (LEC 3.0) This course presents a study of public policy in the United States. Students analyze the policy process, the resulting policy choices and the impact of the choices on the American people. Prerequisite: Pol Sc 90.
- 316 The American Presidency** (LEC 3.0) Historical development of the presidency; emphasis on the constitutional powers and limits of the office and the political contextual variables which influence presidential behavior. Prerequisite: Pol Sc 90 or Hist 176. (Co-listed with Hist 316)
- 317 Program Analysis And Evaluation** (LEC 3.0) An advanced study of major U.S. national policies. A wide range of public policies, including education, economics, and health and welfare will be studied. Students will be introduced to the methods of policy analysis. Emphasis will be placed on the use of tools used by policy analysts to determine program effectiveness and impact. Prerequisite: Pol Sc 90.
- 325 Science, Technology, And Politics** (LEC 3.0) This course will explore the interactions and influences of science and technology upon politics, and of politics upon science and technology. The social and ethical impact of technology and the potential for the democratic management of change will be examined. Prerequisite: Pol Sc 90 or Hist 112 or 175 or 176.
- 335 U.S. Defense Policymaking** (LEC 3.0) This course reviews the evolution of U.S. defense policymaking since World War II, with special emphasis upon strategic policies, weapons systems, and the political processes through which they are selected and implemented. Prerequisite: Pol Sc 90.
- 350 The Politics Of The Third World** (LEC 3.0) This course explores the processes and problems of the developing nations of the world. It examines the internal political processes of third world nations, as well as the position of the third world in international affairs. Prerequisite: Pol Sc 90 or Hist 112 or 175 or 176.
- 383 U.S. Diplomatic History to World War II** (LEC 3.0) This course is a history of American foreign relations, broadly conceived, from the War for Independence to WWII. Among other things, it deals with the diplomacy of survival, of expansion and of economic and political hegemony. Prerequisites: Hist 175, 176 or Pol Sc 90. (Co-listed with Hist 383)
- 384 American Diplomatic History Since World War II** (LEC 3.0) American Diplomatic History

Since World War II will address the major issues in American foreign policy from WWII to the present. Its primary focus is on the Cold War and the post-Cold War problems the U.S. has faced. Prerequisite: History 176 or Pol Sci 90. (Co-listed with History 384)

## Pre-health Professions

The College of Arts and Science has programs of study, which prepare students for success in the professional schools of medicine, dentistry, and related areas of health. Advising of students desiring a pre-health professional background is conducted by a committee in conjunction with the student's department advisors. Interested students may inquire with Dr. Dave Westenberg, Biological Sciences Department, who chairs the Pre-Health Professions Advisory Committee.

### Pre-Medicine Minor

It is recommended that students seeking the Pre-Medicine minor declare their intentions as soon as possible. Students completing the Pre-Medicine minor curriculum in addition to their BA/BS curriculum will have completed all requirements for admission to 95% of all Medical, Dental, Veterinary or other health professional programs. The minor is not intended for a student majoring in Chemistry or Biological Sciences with a Pre-Medicine approved emphasis area. Required courses for the Pre-Medicine minor are:

Pre-Med 110.....Intro to Health Care Careers  
2 semesters of BioSc with Lab (BioSc 110/112 & 211  
2 semesters Gen Chem recommended with lab (Chem 1,2,3,4)  
2 semesters Org Chem with lab (Chem 221, 226, 223, 228)  
2 semesters Physics with lab (Physics 21,22,25 and 26) or (Physics 31,35,22 and 26)  
10 semester hours of math, to include Math 8  
Communications workshop for the Pre-Health Professional Pre-Med 310

### Pre-Medicine Courses

**110 Introduction to Health Careers** (Lect 1.0) This course is for Pre-Medicine students or other interested in careers in the health care industry. Students will be introduced to different career options through invited speakers and independent research. Prerequisite: Admission Requirements.

## Pre-law

### Bachelor of Science

The campus, particularly the College of Arts and Sciences has a variety of programs of study to prepare students for admittance to a professional school of law. Dr. Michael Meagher, Department of History/Political Science, 120 Humanities/Social Sciences Building, is Pre-lawadvisor.

# Psychology

## Bachelor of Science

## Bachelor of Arts

Psychology is the scientific study of mind and behavior. Psychology is both a natural science, which stresses the cognitive and physiological causes of behavior, and a social science, which is directed at understanding how human behavior is affected by cultural and social factors. As a psychology major at UMR, you will be exposed to the many diverse areas of psychology.

Perception, memory, thinking, personality, emotion, motivation, stress and adjustment, abnormal behavior, social relations, and group dynamics are among the basic areas of research in psychology. The discipline also represents the application of these basic research areas to people, their work, and their environment. Clinical, counseling, educational, industrial/organizational, and human factors psychologists are among the professionals who apply basic research to the solution of human problems. Our department provides a broad education to UMR students in both the basic and applied areas of psychology.

The statistics and experimental psychology courses required of our majors prepare you to engage in undergraduate research in your junior or senior years. By collaborating with a faculty member on a research project, you will gain valuable experience for subsequent graduate studies in psychology and related fields or for employment. Supervised practica experience in applied psychological settings, such as human service agencies, is also available for qualified students.

The department offers a choice of two degrees for majors. The Bachelor of Science degree provides a solid foundation in mathematics, biological sciences, physical sciences, and computer science. The Bachelor of Arts degree provides a broad liberal arts foundation, including courses in western civilization and foreign languages. Supporting courses in the humanities and social sciences are offered in both degrees and the psychology requirements are the same in both. In addition to the traditional B.A., B.S. degrees in psychology, the department also offers specialized B.A., B.S. degrees in Psychology that prepare the student for teaching certification in Missouri.

The department also offers four minor programs: a general psychology minor, a minor in industrial/organizational psychology, a minor in the psychology of leadership, and a minor in cognitive neuroscience. The general psychology minor allows students to select from a variety of courses tailored to their needs. The minor in industrial/organizational psychology requires specific courses of benefit to engineering and science majors. The minor in the psychology of leadership is geared for those individuals who would like to become leaders and managers. The cognitive neuroscience minor is designed to give students a broad understanding of neuroscientific principles.

## Faculty

### Professors:

Frances Haemmerlie, (Curators' Teaching Professor)  
Ph.D., Florida State University

Robert Montgomery, (Department Chair), Ph.D.,  
Oklahoma State University

### Associate Professors:

Donald Sharpsteen, Ph.D., University of Denver

### Assistant Professors:

Will Canu, Ph.D., University of Texas

James Martin, Ph.D., Louisiana State University

Michael Nelson, Ph.D., Dartmouth

Julie Patock-Peckham, Ph.D., Arizona State University

### Instructors:

Eugene Gianladis, Ph.D., St. Louis University

Merilee Krueger, M.A., University of Nebraska-Omaha

## Bachelor of Arts

### Psychology

Requirements for an area of concentration in psychology are as follows:

- 1) Introduction to Psychology, General Psychology, Experimental Psychology and Capstone course (either seminar or undergraduate research, 3 hours credit).
- 2) Three additional courses from each of the following two traditional areas of psychology:
  - A) Sensation & Perception, cognitive, learning, neuroscience, developmental, abnormal, social, or personality
  - B) Educational, adolescent, human-computer interaction, industrial, human factors, clinical, group dynamics, or organizational.
- 3) Electives from psychology to complete a requirement of 34 hours.
- 4) Statistics

## Bachelor of Science

### Psychology

- 1) English 20 and 60 (entering students will normally take English 20 either semester of the first year.) (6 hours)
- 2) A total of 23 hours in biological, physical, (chemistry, geology and geophysics, and physics), and mathematical (mathematics/statistics and computer science or Information Science & Technology) sciences, to include Stat 115, Cmp Sc 53 or 73 or IST 51 and at least one course taken in the biological and one in the physical sciences. Of the biological and physical science offering, at least one must be a laboratory course. Courses offered in the Schools of Engineering and Mines and Metallurgy may, at the discretion of the student's major advisor, also count toward the total requirement. (23 hours)
- 3) 12 hours in humanities and fine arts. Foreign language courses may count toward fulfilling this requirement. Courses used to satisfy this requirement must be taken in at least two humanities areas. (12 hours)
- 4) 12 hours in at least two social sciences fields outside the major area. A course in Western Civilization II

(Hist 112), American History to 1877 (Hist 175) or American History since 1877 (Hist 176), or American Government (Pol Sc 90) must be taken to satisfy the requirement of the state of Missouri (the “Williams Law”), and this course may count toward fulfilling the social sciences requirement. (12 hours)

- 5) Minor: A minor will be selected from any discipline other than the major with the approval of the student’s advisor. A total of at least 15 hours is required for the minor, but may include courses, which also satisfy other requirements. At least nine hours must be beyond the introductory level.
- 6) Basic ROTC may be elected in the freshman and sophomore years, but is not creditable toward a degree. Six credit hours of advanced ROTC may be credited toward a degree.
- 7) Elective Credits: In consultation with his/her advisor, each student will elect sufficient additional courses to complete a minimum of 124 credit hours which may include Math 2 or 4 and Math 6.
- 8) Psychology Requirements:
  - A) Introduction to Psychology, General Psychology, Experimental Psychology and Capstone course (either seminar or undergraduate research, 3 hours credit).
  - B) Three additional courses from each of the following two areas of psychology:
    - a) Sensation & Perception, cognitive, learning, neuroscience, developmental, abnormal, social, or personality
    - b) Educational, adolescent, human-computer interaction, industrial, human factors, clinical, group dynamics, or organizational.
  - C) Electives from psychology to complete a requirement of 34 hours.
  - D) A cumulative grade point average of 2.0 must be earned in all course work taken in the major field. Upper class (200- and 300- level) courses completed with grades of “D” may not be included in the major field without the approval of the advisor and the chairman of the department concerned.

## Emphasis Areas

Note: The following areas identify courses from which a student may opt to develop an emphasis area. It is not required that students obtain an emphasis specialty within psychology.

<b>Human Resources/Personnel</b>	<b>Credit</b>
Psych 307-Industrial Psychology . . . . .	3
Psych 308-Social Psychology . . . . .	3
Psych 372-Group Dynamics . . . . .	3
Psych 374-Organizational Psychology . . . . .	3
<b>Human Services</b>	
Psych 208-Psych & Ed Dev Adolescent or Psych 250-Development Psych . . . . .	3
Psych 362-Abnormal Psychology . . . . .	3
Psych 360-Personality Theory . . . . .	3
Psych 368-Clinical Psychology . . . . .	3
<b>Cognitive Neuroscience</b>	
Psych 340-Sensation & Perception . . . . .	3

Psych 240-Theories of Learning or Psych 262-Abnormal Psych . . . . .3  
 Psych 305-Cognitive Psychology . . . . .3  
 Psych 330-Neuroscience . . . . .3

### Usability of Technology

Psych 155-Educational Psychology . . . . .3  
 Psych 211-Web Design and Development . . . . .3  
 Psych 311-Human Factors . . . . .3  
 Psych 314-Human-Computer Interaction . . . . .3

### Psychology of Leadership

Psych 308-Social Psychology . . . . .3  
 Psych 316-Psychology of Leadership . . . . .3  
 Psych 350-Psychology of Women or Psych 372-Group Dynamics . . . . .3  
 Psych 374-Organizational Psychology . . . . .3

## Bachelor of Arts or Bachelor of Science in Psychology (Preparation for Teacher Certification)

In addition to fulfilling the requirements for the Missouri certification for teaching social studies (see Education), specific courses required for a Psychology degree include Psychology 140, 240, 250, 362 or 360, and 308 and Statistics 115. Bachelor of Science students must also take a computer science course and an additional 5 hours of mathematics or science.

## Psychology Minors

The psychology department offers four minors: a general minor, an Industrial/Organizational minor, Psychology of Leadership minor, and a minor in Cognitive Neuroscience. “At least 6 hours of work in the Psychology Minor must be completed in residence at UMR”

### Option (1)

General Psychology Minor requirements require 15 hours of courses in psychology. At least nine of these hours must be at the 200-level or above.

### Option (2)

Industrial/Organizational Psychology Minor requirements include:

- General Psychology (Psych 50)
- Industrial Psychology (Psych 307)
- Social Psychology (Psych 308)
- Human Factors (Psych 311)
- Organizational Psychology (Psych 374)

### Option (3)

Psychology of Leadership requirements include any 5 of the following 6 courses:

- General Psychology (Psych 50)
- Social Psychology (Psych 308)
- Psychology of Leadership (Psych 316)
- Group Dynamics (Psych 372)
- Organizational Psychology (Psych 374)
- Social Influence: Science and Practice (Psych 378)

### Option (4)

Cognitive Neuroscience Minor requirements include:

- General Psychology (Psych 50)
- Sensation and Perception (Psych 340)
- Cognitive Psychology (Psych 305)
- Neuroscience (Psych 330)

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- Abnormal Psychology (Psych 362) or Theories of Learning (Psych 240)

### Psychology Courses

- 10 Introduction to Psychology** (LEC 1.0) An introduction to the study of psychology at UMR. Students will learn about personal and professional opportunities associated with the different areas of psychology and become acquainted with the psychology faculty and campus facilities.
- 50 General Psychology** (LEC 3.0) An introduction to the science of the human mind and behavior. Topics include brain structure and function, human development, learning and memory, motivation, emotion, personality and psychological health, psychological disorders and their treatment, and social cognition and human relationships.
- 100 Special Problems** (IND 0.0-6.0) Problems or readings on specific subjects or projects in the department. Consent of instructor required.
- 101 Special Topics** (Variable 0.0-6.0) This course is designed to give the department an opportunity to test a new course. Variable title.
- 140 Experimental Psychology** (LEC 3.0 and LAB 1.0) An introduction to the content, models, and methodologies of psychological research. The student is exposed to fundamental components in conducting psychological research including the literature review, experimental design, statistical analyses, and interpretation. Prerequisite: Psych 50, Stat 115.
- 154 Psychology Of Personal Adjustment** (LEC 3.0) Major factors related to adjustment and everyday coping: dating, parent-child relationships, death and dying, stress, and modifying one's own behavior. Prerequisite: Psych 50.
- 155 Educational Psychology** (LEC 3.0) (Meets UMR-UMC Cooperative Teacher Education Requirement). Principles of psychology relevant to the field of education. Concepts of human growth and development; the learning process, with special emphasis on abilities and teaching-learning process; measurement and evaluation of school learning; mental health in the classroom. Observation of children will be included. Prerequisite: Psych 50. (Co-listed with Educ 102)
- 200 Special Problems In Psychology** (IND 0.0-6.0) Problems or readings on specific subjects or projects in the department. Consent of instructor required.
- 201 Special Topics** (Variable 0.0-6.0) This course is designed to give the department an opportunity to test a new course. Variable title.
- 205 Thinking And Problem Solving** (LEC 3.0) Covers Psychological research on thinking and problem solving. Focuses on the implications of research findings for improving thinking. Heuristic strategies for creative thinking, decision making, remembering, problem solving, reasoning and other cognitive processes are covered from a behavioral science perspective. Prerequisite: Psych 50.
- 208 Psychological & Educational Development Of The Adolescent** (LEC 3.0) A theoretical and empirical examination of the psychological and educational development of the adolescent. Prerequisite: Psych 50.
- 211 Web Design And Development** (LEC 1.5 and LAB 1.5) In this course students learn design principles for effectively structuring information for the World Wide Web; how to use tools to deploy this information; and methods for assessing Web usability. The course is project based with an emphasis on the application of design and usability assessment within the context of student projects. Prerequisite: IST 151.
- 240 Theories Of Learning** (LEC 3.0) Examination of basic processes of conditioning and learning. Topics covered include classical conditioning, extinction, discrimination learning, retention and transfer of training. Prerequisite: Psych 50.
- 246 Motivation And Emotion** (LEC 3.0) An examination of the ways in which situational, cognitive, and emotional factors influence, and are influenced by, human motivation. Motivation and emotion in social contexts will be emphasized. Prerequisite: Psych 50.
- 250 Developmental Psychology** (LEC 3.0) An examination of changes in social, cognitive, personality and physiological processes that occur with age. Attention is focused on human development throughout the life span. Prerequisite: Psych 50.
- 290 History Of Psychology** (LEC 3.0) An examination of the origin of psychology within the framework of philosophy and science. Traces the major trends, schools, and individuals from antiquity to the present. Major scientific, cultural, philosophical and personal influences in the development of psychology. Prerequisite: Psych 50.
- 300 Special Problems And Readings In Psychology** (IND 0.0-6.0) Problems or readings on specific subjects or projects in the department. Consent of instructor required.
- 301 Special Topics** (Variable 0.0-6.0) This course is designed to give the department an opportunity to test a new course. Variable title.
- 302 Internship** (IND 0.0-6.0) Internship will involve students applying critical thinking skills and discipline specific knowledge in a work setting based on a project designed by the advisor and employee. Activities will vary depending on the student's background and the setting. Prerequisite: Senior status; must have completed 24 hours in major.
- 305 Cognitive Psychology** (LEC 3.0) An examination of the basic cognitive processes and their roles in human intelligence and behavior. Topics include attention, memory, knowledge representation, problem solving, decision making, reasoning, language, and consciousness. Prerequisite: Psych 50.
- 307 Industrial Psychology** (LEC 3.0) A general survey of the field of industrial/organizational psy-

- chology including topics such as organizational entry (recruitment, selection, training), involvement and participation (motivation, performance assessment, leadership) and organizational influences on work behavior and work attitudes. Prerequisite: Psych 50.
- 308 Social Psychology** (LEC 3.0) Social basis of behavior of individuals in social stimulus situations. Prerequisite: Psych 50.
- 310 Seminar** (IND 0.0-6.0) Prerequisite: Senior Standing.
- 311 Human Factors** (LEC 3.0) An examination of human-machine systems and the characteristics of people that affect system performance. Topics include applied research methods, systems analysis, and the perceptual, cognitive, physical and social strengths and limitations of human beings. The focus is on user-centered design of technology, particularly in manufacturing environments. Prerequisite: Psych 50. (Co-listed with Eng Mg 311)
- 312 Practicum In Human Services Psychology** (LAB 3.0) Practicum will involve experience in a human service setting. Depending on student background and setting, activities may involve learning psychological testing, interviewing, assessment and/or counseling skills. Prerequisite: Psych 50 and Psych 262 or 364 or 268 or 356 and instructor approval.
- 314 Human-Computer Interaction** (LEC 3.0) Research, theory, and practice from psychology and other social science disciplines have implications for the effective design and use of computers in organizations. This course introduces students to the psychological issues in software engineering, technology in the workplace, and organizational design. Prerequisite: Psych 50.
- 315 Environmental Psychology** (LEC 3.0) Study of the psychological effects of different environments and socially relevant problems. Topics covered include: environmental perception, attitudes toward the environment, effects of the environment in work performance, environmental stressors, crowding and the effects of urban environments on interpersonal relations. Prerequisite: Psych 50.
- 316 Psychology of Leadership in Organizations** (LEC 3.0) This course will examine the characteristics of effective versus ineffective leadership. Topics will include theories of leadership, measurement issues, leader-member relationships, charismatic, leadership, small group leadership, and strategic leadership in organizations. Practical guidelines for developing leadership skills will be discussed. Prerequisite: General Psychology
- 330 Neuroscience** (LEC 3.0) The neurophysiological bases of behavior and cognition are examined. Topics covered include neuroanatomy, neurophysiology, neurotransmission, neuropharmacology, vision, hearing and language, motivated behavior (e.g. eating, drinking, and sexual behavior), learning and memory, cognition and consciousness, and neurologic/psychiatric disorders. Prerequisite: Psych 50.
- 340 Sensation and Perception** (LEC 3.0) An in-depth examination of the human senses, with special emphasis on vision and hearing. Topics include the anatomy and physiology of the eye and ear, neural transduction, the organization and interpretation of sensory signals by the brain, selective attention, and the neural basis of the perception of color, form, space, depth, motion, music, and language. Prerequisite: Psych 50.
- 342 Comparative Psychology** (LEC 3.0) A survey of the contributions of comparative psychology, ethology, and other disciplines to the understanding of behavior. The major emphasis will be on the genetic, developmental, and social determinants of adaptive behavior patterns.
- 345 Evolutionary Psychology** (LEC 3.0) Fundamental principles of evolution, and their applicability to human behavior and psychological processes, will be examined. The course will focus on theoretical rationales for an evolutionary approach to psychology and on looking critically at recent research in the field. Prerequisites: Psych 50 and Psych 140.
- 350 Psychology of Women** (LEC 3.0) A history of the psychology of women with a focus on the latest research and theories in the field (e.g., research methods, gender theories, biological and social factors, communication and leadership styles, nature of interpersonal relationships, and health and mental issues). Prerequisite: Psych 50.
- 354 Psychology Of The Exceptional Child** (LEC 3.0) An understanding of the abilities and disabilities of children classified as exceptional, the instructional organization utilized to meet the needs of the exceptional child in the classroom, the import of educational and psychological handicaps upon these children. Guest lectures and field trips. Prerequisite: Psych 50. (Co-listed with Educ 354)
- 356 Behavior Modification** (LEC 3.0) Theory and techniques of influencing human behavior through the use of behavior modification and behavior therapy techniques. Applications to normal and abnormal child, adolescent and adult populations will be considered as well as ethical and legal issues. Prerequisite: Psych 50.
- 360 Personality Theory** (LEC 3.0) A comparative examination of theories of personality organization and functioning. Origins of personality; personality development and change; current developments and research in the area of personality. Prerequisite: Psych 50.
- 362 Abnormal Psychology** (LEC 3.0) An introductory study of various forms of personality and behavioral disorders. Consideration will be given to neurosis, psychosis, mental deficiency and other deviations, with emphasis on etiology and treatment. Prerequisite: Psych 50.
- 364 Theory And Practice Of Psychological Testing** (LEC 3.0) Theoretical and statistical basis of

psychological testing and measurement; characteristics of well-known statistical tests of intelligence, aptitude, interest, academic proficiency, and personality; use of tests and test batteries for prediction of criteria. Prerequisite: Psych 50.

- 368 Clinical Psychology** (LEC 3.0) Comprehensive survey of the field of clinical psychology. Course will cover a variety of assessment and treatment procedures relevant to psychology and other professionals who treat human adjustment problems; techniques based on experimental outcome research and psychological testing will be emphasized. Prerequisites: Psych 50 and Psych 262.
- 370 Advanced Social Psychology** (LEC 3.0) An advanced study of the behavior of individuals in interaction within groups. Consideration will also be given to the experimental literature dealing with the formal properties of groups, conformity and deviation, intergroup relations, and attitude formation and attitude change. Prerequisite: Psych 270.
- 372 Group Dynamics** (LEC 3.0) Theories of group process. Group structure, functions, interaction, power, norms, and communication. Correlates of cohesiveness and problem solving will be investigated. Prerequisite: Psych 50.
- 374 Organizational Psychology** (LEC 3.0) This course seeks to comprehend and predict human behavior in organizational settings through the scientific study of individual processes, group processes, and organizational structure and function. Prerequisite: Psych 50.
- 376 Sports And Exercise Psychology** (LEC 3.0) Examines psychological theories and research related to sport and exercise behavior by providing a broad overview of topics from the literature of psychology. Prerequisite: Psych 50.
- 378 Social Influence: Science and Practice** (LEC 3.0) Principles and procedures that affect the process of social influence, with consideration given to attitudinal, compliance inducing, and perceptual influences. Prerequisite: General Psychology
- 380 Cross-Cultural Psychology** (LEC 3.0) Providing a cross-cultural perspective is an essential element of current curricula in psychology. Students need an understanding of how self-concepts, cognitive abilities and social relations are affected by cultural factors. Prerequisites: Psych 50 and Psych 155 or Psych 270.
- 390 Undergraduate Research** (IND 0.0-6.0) Designed for the undergraduate student who wishes to engage in research. Not for graduate credit. Not more than six credit hours allowed for graduation credit. Subject and credit to be arranged with the instructor.

# Russian

## Russian Courses

- 1 Elementary Russian I** (LEC 4.0) Introduction to reading, conversation, and grammar. Laboratory required (one extra hour per week). Prerequisite: Entrance requirements.
- 2 Elementary Russian II** (LEC 4.0) Continuation of Russian I. Prerequisite: Russ 1.
- 80 Readings In Science And Literature** (LEC 4.0) Readings in scientific writings and literature for improving comprehension of Russian publications. Prerequisite: Russ 2.
- 100 Special Problems** (IND 0.0-6.0) Problems or readings on specific subjects or projects in the department. Consent of instructor required.
- 101 Special Topics** (Variable 0.0-6.0) This course is designed to give the department an opportunity to test a new course. Variable title.
- 110 Basic Russian Conversation** (LEC 2.0) Russian conversation and oral practice. Prerequisite: Russ 2.
- 170 Masterpieces Of Russian Literature** (LEC 3.0) Selected major works of Russian literature. Prerequisite: Russ 80.
- 180 Basic Russian Composition** (LEC 3.0) Composition and translation from English. Prerequisite: Preceded or accompanied by Russ 110.
- 200 Special Problems** (IND 0.0-6.0) Problems or readings on specific subjects or projects in the department. Consent of instructor required.
- 201 Special Topics** (Variable 0.0-6.0) This course is designed to give the department an opportunity to test a new course. Variable title.
- 300 Special Problems** (IND 0.0-6.0) Problems or readings on specific subjects or projects in the department. Consent of instructor required.
- 301 Special Topics** (Variable 0.0-6.0) This course is designed to give the department an opportunity to test a new course. Variable title.
- 310 Seminar** (IND 0.0-6.0) Discussion of current topics. Prerequisite: Senior standing.
- 311 Advanced Russian Conversation** (LEC 2.0) Advanced Russian conversation and oral practice. Prerequisite: Russ 110.
- 360 Russian Civilization** (LEC 3.0) Introduction to Russian history and culture from the 9th to the 20th century exploring the interrelation between Russian society, its history and its cultural expression in painting, literature, music and architecture over the past thousand years. The periods covered include Kievan Russia, the birth of Christianity, the Mongol invasion, Ivan the Terrible, Peter the Great, Catherine the Great, and Imperial Russia. Prerequisite: Hist 112.
- 370 Survey Of Russian Literature I** (Early Period) (LEC 3.0) A study of the history and development of 16th, 17th, 18th, and 19th century Russian literature. Prerequisite: Russ 170.

**375 Survey Of Russian Literature II** (Modern Period) (LEC 3.0) 20th Century Russian Literature. Prerequisite: Russ 170.

## Sociology/ Anthropology

Sociology is the study of interpersonal relationships. The sociologist seeks an understanding of the development and functioning of human society.

Anthropology is the study of human cultures.

In your sociology studies, you will take courses which deal with such subjects as the social bases of poverty, race conflict, culture change, urban-rural differences in values and attitudes, population growth, ethnic pride and nationality, community disorganization, family instability, social conflict in schools, changes in work expectations, and deviant behavior.

In your cultural anthropology studies, you will be concerned with the similarities and differences among human societies and with the documentation and understanding of sociocultural variation. You will formulate scientifically valid generalizations relating to the nature of individuals and society based on the application of a comparative (cross-cultural) and a holistic (totalistic) perspective.

### Sociology Minor Curriculum

To qualify for a minor degree in sociology, all students must take 15 hours of course work in sociology/anthropology to be chosen in compliance with the following stipulations: one three-hour introductory survey course (either Sociology 81, General Sociology; or Sociology 85, Cultural Anthropology) plus at least 12 hours of courses at the 100-level and above.

### Sociology Courses

- 81 General Sociology** (LEC 3.0) Broad, general introduction to sociology, the purpose of which is to acquaint the student with what sociology is, what sociologists do and why; to familiarize the student with the outlines of the history of sociology, the concepts and tools of discipline, its investigatory procedures, theoretical position, subject matter, and aims and achievement.
- 85 Cultural Anthropology** (LEC 3.0) Broad, general introduction to cultural anthropology, the purpose of which is to acquaint the student with what anthropology is, what anthropologists do and why; to familiarize the student with the outlines of the history of anthropology, the concepts and tools of the discipline, its investigatory procedures, theoretical positions, subject matter, and aims and achievements.
- 100 Special Problems** (IND 0.0-6.0) Problems or readings on specific subjects or projects in the department. Consent of instructor required.
- 101 Special Topics** (Variable 0.0-6.0) This course is designed to give the department an opportunity to test a new course. Variable title.
- 105 Social Organization** (LEC 3.0) Analysis of the concept of social organization; structure and functioning of social institutions and the processes of integration and social change; some focus on how people organize themselves in different societies, from simple hunting-gathering levels of adaptation to modern industrial states. Prerequisite: Sociol 81 or 85.
- 121 Human Ecology** (LEC 3.0) Study of influence of social and physical environment on a group's organization and operation. Prerequisite: Sociol 81 or 85.
- 160 Hispanic Culture** (LEC 3.0) An interdisciplinary course that examines the culture of the Hispanic world (with an emphasis on Latin America). The presentation is in Spanish, and social science concepts and methods are stressed. Topics include: bilingualism, multiculturalism, economic development, and political stability. Prerequisite: Span 80.
- 200 Special Problems** (IND 0.0-6.0) Problems or readings on specific subjects or projects in the department. Consent of instructor required.
- 201 Special Topics** (Variable 0.0-6.0) This course is designed to give the department an opportunity to test a new course. Variable title.
- 210 Seminar** (IND 0.0-6.0) Discussion of current topics.
- 218 Social Change** (LEC 3.0) A study of the processes involved in social change, including how to intervene in those processes or how to direct the change process. Prerequisite: Sociol 81, or 85, or 105.
- 220 The Community** (LEC 3.0) Origins and structure of communities, their boundaries, components, and action processes. Prerequisite: Sociol 81 or 85.
- 225 Culture And Personality** (LEC 3.0) Cross-cultural examination of the relationships among the individual, society, and culture; types of socialization; the sociocultural factors underlying personality development. Prerequisite: Sociol 81 or 85.
- 231 Social Stratification** (LEC 3.0) Caste and class structure and its relation to other aspects of social organization, such as power and authority, access to resources, socialization, self-concept. Prerequisite: Sociol 81 or 85.
- 235 Industrial Sociology** (LEC 3.0) The structure and function of work organizations; formal and informal lines of communication and authority; impact of industrialization on other institutions. Prerequisite: Sociol 81 or 85.
- 240 Sociology Of Complex Organizations** (LEC 3.0) The socio-political and socio-economic environment of complex organizations (e.g., private corporations, government agencies, and voluntary associations), their formal and informal structures, their consequences for the individual and society. Prerequisite: Sociol 81 or 85.
- 245 Ethnicity And Nationality** (LEC 3.0) Ethnic and national group identity and interrelationships

within the context of prevailing ideology. Prerequisite: Sociol 81 or 85.

- 251 Urban And Rural Sociology** (LEC 3.0) Study of urban society, including occupational structure, class and status systems, racial and cultural relations, and mass transportation and communication; and of rural society, with an emphasis on the adaptations of rural people to a primarily urban mass society. Prerequisite: Sociol 81 or 85.
- 260 Deviant Behavior** (LEC 3.0) Examination of various types of deviant behavior and their relationship to the social order. Prerequisite: Sociol 81 or 85.
- 265 Sociology Of Education** (LEC 3.0) The school as a social system and its inter-relationship with the larger society. Meets requirement of UMC "Comparative Foundations of Education" (B-352). Prerequisite: Sociol 81 or 85.
- 281 Family And Marriage** (LEC 3.0) Variations, organization, and operation of family systems. Prerequisite: Sociol 81 or 85.
- 300 Special Problems** (IND 0.0-6.0) Problems or readings on specific subjects or projects in the department. Consent of instructor required.
- 301 Special Topics** (Variable 0.0-6.0) This course is designed to give the department an opportunity to test a new course. Variable title.
- 310 Seminar** (IND 0.0-6.0) Discussion of current topics. Prerequisite: Senior standing.
- 321 Social Theory** (LEC 2.0 and LAB 1.0) Examination of propositions about society and how and why it functions. Prerequisite: Any 200-level Sociol course.
- 342 Social Investigation** (LEC 3.0) Research methods and their applications in the analysis of society. Prerequisite: Any 200-level Sociol course.
- 380 Social Organization** (LEC 3.0) Analysis of the concept of social organization; structure and functioning of social institutions and the processes of integration and social change; some focus on how people organize themselves in different societies, from simple hunting-gathering levels of adaptation to modern industrial states. Prerequisite: Soc 81 or 85.
- 383 Social Science Foreign Area Field Study** (LEC 3.0) First hand empirical investigation of problems in a foreign setting. Prerequisite: Any 200-level Sociol course.

## Spanish

### Spanish Courses

- 1 Elementary Spanish I** (LEC 4.0) Introduction to Spanish. Oral drills, readings, grammar and composition. Laboratory required (one extra hour per week). Prerequisite: Entrance requirements.
- 2 Elementary Spanish II** (LEC 4.0) Continuation of Spanish I. Laboratory required (one extra hour per week). Prerequisite: Span 1.
- 60 Hispanic Civilization** (LEC 3.0) General survey of Spanish culture and life with an emphasis on

the 20th century. (Taught in English). Prerequisite: Entrance Requirements.

- 80 Readings And Composition** (LEC 4.0) Intermediate readings in Spanish. Prerequisite: Span 2.
- 90 Scientific Spanish** (LEC 3.0) Reading representative writings in sciences and technology. Emphasis on scientific literature in the student's major and minor fields. Prerequisite: Span 2.
- 100 Special Problems** (IND 0.0-6.0) Problems or readings on specific subjects or projects in the department. Consent of instructor required.
- 101 Special Topics** (Variable 0.0-6.0) This course is designed to give the department an opportunity to test a new course. Variable title.
- 110 Basic Spanish Conversation** (LEC 2.0) Spanish conversation and oral practice. Prerequisite: Span 2.
- 160 Hispanic Culture** (LEC 3.0) An interdisciplinary course that examines the culture of the Hispanic world (with an emphasis on Latin America). The presentation is in Spanish, and social science concepts and methods are stressed. Topics include: bilingualism, multiculturalism, economic development, and political stability. Prerequisite: Span 80.
- 170 Masterpieces Of Hispanic Literature** (LEC 3.0) A study of the major works in Spanish and Spanish American literature. Prerequisite: Span 80.
- 180 Intermediate Spanish Composition** (LEC 3.0) Practice in writing Spanish: compositions and written translations. Prerequisite: Span 80.
- 200 Special Problems** (IND 0.0-6.0) Problems or readings on specific subjects or projects in the department. Consent of instructor required.
- 201 Special Topics** (Variable 0.0-6.0) This course is designed to give the department an opportunity to test a new course. Variable title.
- 277 Literature In Translation** (Spanish) (LEC 3.0) Representative Spanish American works in English translation, with emphasis on the contemporary novel. Prerequisite: English 20.
- 300 Special Problems** (IND 0.0-6.0) Problems or readings on specific subjects of projects in the department. Consent of instructor required.
- 301 Special Topics** (Variable 0.0-6.0) This course is designed to give the department an opportunity to test a new course. Variable title.
- 310 Seminar** (IND 1.0-3.0) Discussion of current topics.
- 311 Advanced Spanish Conversation** (LEC 2.0) Advanced Spanish conversation and oral practice. Prerequisite: Span 110.
- 370 Survey Of Spanish Literature** (LEC 3.0) Survey of Spanish literature from Medieval to Modern Times, including the Renaissance, Siglo De Oro, Enlightenment, Romanticism, and the 20th century.. Prerequisite: Span 170 or native ability.
- 371 Survey Of Spanish American Literature** (LEC 3.0) Survey of Spanish American literature from the Conquest to Modern Times, including the Chronicles, Renaissance, Baroque, Neo-classicism, Romanticism, the Modernistic Movement, and the



20th century. Prerequisite: Span 170 or native ability.

- 377 Spanish-American Novel And Short Story** (LEC 3.0) A study of the development of narrative prose in Spanish America. Prerequisite: Span 170.
- 378 Novela Proletaria** (LEC 3.0) A study of the fiction written during the Great Depression in Latin America, examining principally problems in the exploitation of oil, the mining of minerals, and of urban poverty. Prerequisite: Span 170.
- 379 Literature Of Hispanic Nations** (LEC 3.0) The study of the contemporary literature of Hispanic nations: Chile, Argentina, Mexico, Venezuela, Colombia, Peru or Spain.

## Speech and Media Studies

Communication is a fundamental part of every human interaction, whether among friends, in the workplace, or as the citizens and leaders of our communities. Because it is so common in our daily lives, too often we forget that a solid understanding of how communication works is essential to the process of becoming an effective member of our work and public communities. Without competence in communicating ideas to others, our ideas—however brilliant—cannot be understood by others and so are wasted. Courses in Speech and Media Studies will help students develop the necessary theoretical understanding, critical and analytical insight, and practical expertise to be the effective communicators and leaders of the future.

The Speech & Media Studies program offers two minor programs of study: a minor in Communication Studies and a Leadership Communication minor. Elective courses, including interpersonal, small group, business and professional, intercultural, mass, and leadership communication complete the communication studies minor and are also incorporated into the leadership minor. Additional courses may be selected in consultation with the minor advisor and substituted for the elective hours when the student's particular needs and interests in communication warrant.

### Faculty

#### Professor:

W. Lance Haynes, (Director) Ph.D., University of Minnesota

#### Lecturer:

Cheryl Lillie, M.A., SIU-Edwardsville  
 Marsha Kaiser, M.A., University of Nebraska  
 Wilma Turner, M.A., Baylor University

### Minor Curriculum in Communications

The Speech and Media Studies program of the department of Arts, Languages & Philosophy offers two minor degrees in communication: **Communication**

and **Leadership Communication**. Each minor requires fifteen hours of study.

## I. Communication Studies

### Core Requirements (3 hours):

- SP&M S 181-Communication Theory

### Elective requirements, select 4 (12 hours):

- SP&M S 85-Principles of Speech
- SP&M S 100-Special Problems
- SP&M S 101-Special Topics
- SP&M S 150-Interpersonal Communication
- SP&M S 200-Special Problems
- SP&M S 201-Special Topics
- SP&M S 235-Intercultural Communication
- SP&M S 255-Discussion & Conference Methods
- SP&M S 275-Foundations of Video Communication
- SP&M S 283-Business and Professional Communication

Advisor or approved substitute for one of the above.

## II. Leadership Communication

### Core Requirement (3 hours)

- SP&M S 181-Communication Theory

### Additional Requirements (12 hours):

- SP&M S 150-Interpersonal Communication or
- SP&M S 235-Intercultural Communication
- SP&M S 255-Discussion & Conference Methods
- SP&M S 265-Leadership Communication
- SP&M S 270-Leadership Practices

## Speech and Media Studies Courses

- 85 Principles Of Speech** (LEC 3.0) A study of the arts of expression, oral communication, and listening (theory and practice); effective interaction of speech, speaker, listener, and occasion. Prerequisite: Entrance requirements.
- 100 Special Problems** (IND 0.0-6.0) Problems or readings on specific subjects or projects in the department. Consent of instructor required.
- 101 Special Topics** (Variable 0.0-6.0) This course is designed to give the department an opportunity to test a new course. Variable title.
- 121 Design And Production For The Print Media** (LEC 3.0) Study of the development of elements of editing and typography. Examines development of editorial principles and styles to understand how editors reach decisions about what is printed and to help achieve a critical sense in dealing with the print media. Prerequisite: English 1 or 60 or Speech 181.
- 181 Communication Theory** (LEC 3.0) Deals with the concerns addressed by communication theory: language, cybernetics, visual arts, general semantics, information theory, and electronic communications. The university's fairly extensive media and communications resources are made use of, both for their content and for a study of the impact of their forms upon the transfer of information.

- 200 Special Problems** (IND 0.0-6.0) Problems or readings on specific subjects or projects in the department. Consent of instructor required.
- 201 Special Topics** (Variable 0.0-6.0) This course is designed to give the department an opportunity to test a new course. Variable title.
- 210 Seminar** (IND 0.0-6.0) Discussion of current topics.
- 221 The Study Of Photography** (LEC 3.0) An introduction to photographic communication. Includes a study of basic camera techniques, black, and white film and print processing, the use of 35mm and larger format cameras, and photographic history and aesthetics.
- 235 Intercultural Communication** (LEC 3.0) Examines the range of human differences as variables in the communication process; emphasis on broadening individual perspectives regarding the range of human experience. Particularly useful for students who will work and live in environments unlike those previously encountered. Prerequisite: Sp&M S 181.
- 250 Interpersonal Communication** (LEC 3.0) Explores the theoretical and practical dimensions of human communication in significant one-on-one relationships. Emphasis on theoretical approaches to identify and achieve particular outcomes desired in professional and personal interactions. Prerequisite: Sp&M S 181.
- 255 Discussion And Conference Methods** (LEC 3.0) Explores the theoretical and practical dimensions of human communication in task-oriented small groups with emphasis on producing desired outcomes. Particularly useful for students who wish to improve their ability to work in small group environments. Prerequisite: SP&M S 181.
- 265 Leadership Communication** (LEC 3.0) This course explores various approaches to leadership with emphasis on the communication theories and behaviors associated with leadership in modern corporate and public contexts. Prerequisites: Sp&M S 181, 250.
- 270 Leadership Practices** (LEC 3.0) This course provides opportunities for students to do qualitative and quantitative research in leadership, small group, and organizational communication associated with activities in the Oral Communication Center. Prerequisite: Sp&M S 265 or permission of instructor.
- 275 Foundations Of Video Communication** (LEC 3.0) Examines the historical, social, and psychological impact of television as a base from which the course explores and applies critical and creative theories of effective television communication. Includes limited video production experience. Prerequisite: Sp&M S 181 or consent of instructor.
- 283 Business And Professional Communication** (LEC 3.0) Examines culture and communication in the workplace from theoretical and practical perspectives. Topics include: group communication, interviewing, networking, planning and presenting material to technical and general audiences interpersonal communication and leadership in the workplace context. Prerequisites: SP&M S 150, 181 or permission of instructor.
- 300 Special Problems** (IND 0.0-6.0) Problems or readings on specific subjects of projects in the department. Consent of instructor required.
- 301 Special Topics** (Variable 0.0-6.0) This course is designed to give the department an opportunity to test a new course. Variable title.
- 310 Seminar** (IND 0.0-6.0) Discussion of current topics. Prerequisite: Senior standing.
- 390 Undergraduate Research** (IND 0.0-6.0) Designed for the undergraduate student who wishes to engage in research. Not for graduate credit. Not more than six (6) credit hours allowed for graduation credit. Subject and credit to be arranged with the instructor. Prerequisite: Consent of instructor.

## Statistics

(See Mathematics and Statistics)

### Statistics Courses

- 101 Special Topics** (Variable 0.0-6.0) This course is designed to give the department an opportunity to test a new course. Variable title.
- 111 Business And Economic Statistics I** (LEC 3.0) This is an introductory course in business and economic statistics. Our main objective is to familiarize the student with elementary statistical concepts within the context of numerous applications in Business and Economics. We will highlight the primary use of statistics, that is, to glean information from an available sample regarding the underlying population. Prerequisite: Math 2 or Math 4 with a grade of "C" or better. (Co-listed with Econ 111)
- 115 Statistics For The Social Sciences I** (LEC 3.0) A survey course in statistics for the social and behavioral sciences. Main emphasis is on inductive rather than traditional descriptive statistics. Attention given to the design of experiments, sampling procedures, basic probability distributions, tests of significance, linear regression and correlation, and analysis of variance. Not advised for engineering or science curricula.
- 116 Statistics For The Social Sciences II** (LEC 3.0) A course on statistical methodology for the social and behavioral sciences. Regression, analysis of variance, forecasting, and use of statistical computer packages. Prerequisite: Stat 115 with a grade of "C" or better.
- 201 Special Topics** (Variable 0.0-6.0) This course is designed to give the department an opportunity to test a new course. Variable title.
- 211 Statistical Tools For Decision Making** (LEC 2.0 and LAB 1.0) An introduction to statistical tech-

niques commonly used in management decision making. Topics include statistical inference of population parameters, linear regression, basics of experimental design and analysis, analysis of categorical data, and the use of statistical software. Credit will be given for only one of Stat 211, 213, 215 or 217. Prerequisite: Math 8 or 14 with a grade of "C" or better.

- 213 Applied Engineering Statistics** (LEC 3.0) An introduction to applied statistical methods in engineering dealing with basic probability, estimation, tests of hypotheses, regression, design of experiments and control charts. Statistical computer packages will be used in connection with some of the material studies. Credit will be given for only one of Stat 211, 213, 215 or 217. Prerequisite: Math 15 or 21 with a grade of "C" or better.
- 215 Engineering Statistics** (LEC 3.0) An introduction to statistical methods in engineering and the physical sciences dealing with basic probability, distribution theory, confidence intervals, significance tests, and sampling. Credit will be given for only one of Stat 211, 213, 215 or 217. Prerequisite: Math 15 or 21 with a grade of "C" or better.
- 217 Introduction To Probability And Statistics** (LEC 3.0) Introduction to probability, distribution theory, statistical inference, with applications to physical and engineering sciences. Probability, probability and joint distributions, functions of random variables, system reliability, point and interval estimation, testing hypotheses, regression analysis. Credit will be given for only one of Stat 211, 213, 215, or 217. Prerequisite: Math 22 with a grade of "C" or better.
- 300 Special Problems** (IND 0.0-6.0) Problems or readings on specific subjects or projects in the department. Consent of instructor required.
- 301 Special Topics** (Variable 0.0-6.0) This course is designed to give the department an opportunity to test a new course. Variable title.
- 305 Making Sense Of Data For Elementary School Teachers** (LEC 3.0) An activity based course that is intended to provide elementary school teachers with the skills necessary to implement the Probability & Statistics strand of the American Statistical Association of the National Council of Teachers of Mathematics (NCTM) joint. Prerequisite: Graduate Standing.
- 306 Making Sense Of Data For Middle School Teachers** (LEC 3.0) An activity based course that is intended to provide middle school teachers with the skills necessary to implement the Probability & Statistics strand of the American Statistical Association of the National Council of Teachers of Mathematics (NCTM) joint.
- 307 Making Sense Of Data For High School Teachers** (LEC 3.0) An activity based course that is intended to provide high school teachers with the skills necessary to implement the Probability & Statistics strand of the American Statistical Association of the National Council of Teachers of Mathematics (NCTM) joint.
- 314 Applied Time Series Analysis** (LEC 3.0) Introduction to time series modeling of empirical data observed over time. Topics include stationary processes, autocovariance functions, moving average, autoregressive, ARIMA, and GARCH models, spectral analysis, confidence intervals, forecasting, and forecast error. Prerequisites: One of Stat 213, 215, 217, 343 and one of Math 203, 208, or 308.
- 320 Statistical Methods** (LEC 3.0) A continuation of Stat 215 with emphasis on statistical methods. Topics would include further work on regression analysis, control charts, acceptance sampling, nonparametric statistics, goodness of fit tests, reliability and life-testing, analysis of experimental designs. Prerequisite: Stat 215.
- 325 Introduction to Biostatistics** (LEC 3.0 and LAB 1.0) Introduction to common biostatistical methods for designing research studies, collecting and analyzing data, with application to problems originating from the biological, environmental, and health sciences. Topics include randomization, means comparisons, ANOVA, regression, and analysis of count data. Prerequisite: Math 04 or equivalent.
- 343 Probability And Statistics** (LEC 3.0) Introduction to the theory of probability and its applications, sample spaces, random variables, binomial, Poisson, normal distributions, derived distributions, and moment generating functions. Prerequisite: Math 22.
- 344 Mathematical Statistics** (LEC 3.0) A continuation of Stat 343 with introduction to the theories of point estimation, hypothesis testing, and interval estimation. Includes sufficiency, completeness, likelihood and how they apply to the exponential family. Prerequisite: Stat 343.
- 346 Regression Analysis** (LEC 3.0) Simple linear regression, multiple regression, regression diagnostics, multicollinearity, measures of influence and leverage, model selection techniques, polynomial models, regression with autocorrelated errors, introduction to non-linear regression. Prerequisites: Math 22 and one of Stat 211, 213, 215, 217, or 343. (Co-listed with Cmp Sc 366)
- 353 Statistical Data Analysis** (LEC 3.0) Introduction to methods for analyzing statistical data from experiments and surveys. Analysis of variance, correlation, introduction to regression techniques, contingency tables, non-parametric techniques and introduction to modern statistical software. Prerequisites: Math 22 and one of Stat 115, 213, 215 and 217.
- 390 Undergraduate Research** (IND 0.0-6.0) This course is designed for the undergraduate student who wishes to engage in research. It is not to be used for graduate credit nor for more than six credit hours of undergraduate credit. The subject and credit are to be arranged with the instructor. Prerequisite: Consent of instructor.

# Technical Communication

## Bachelor of Science in Tech Comm.

## Master of Science in Tech Comm.

The Technical Communication program is offered in the Department of English and Technical Communication.

The Technical Communication degree offers you an entry into a growing profession that communicates information about the purpose and operation of human tools. Technical communicators work at the interface of technical experts and product users. Consequently, technical communicators provide an essential service to national and global societies by facilitating technology transfer.

You should bring to the program a love of writing and a curiosity about technology. The interdisciplinary nature of the UMR degree enables you to acquire the qualifications you need to be competitive and flexible in an ever-changing technological environment. When you graduate, you will have a solid technical background in computer-enhanced information systems, an understanding of how organizations function, and strong communication skills. Areas employing technical communicators include computer manufacturing and software development, consumer electronics, banking and financial institutions, telecommunications, chemical and pharmaceuticals, hospitals and research labs, and academic institutions and libraries.

You will study both the theory and practice of communication in written, oral and visual forms. Specifically, you will study and practice the production of a variety of technical documents in print, electronic, and digital forms. You will have experience with the process of project management in a user community and become adept in audience analysis, needs assessment, document design, and team building.

In UMR's unique environment, you will have opportunities to work alongside engineers and scientists in undergraduate research and design projects. Also, you are strongly encouraged to do summer internships or co-ops with companies before you graduate. At UMR you will work with first-class faculty, associate with excellent students from around the country and the world, and benefit from the world-class computer environment. Your theoretical and practical education will prepare you for full-time employment and lifelong learning.

## Faculty

### Associate Professors:

Gene Doty, M.A., Emporia State University  
Kristine Swenson, Ph.D., University of Iowa

### Assistant Professors:

Ed Malone, Ph.D., University of Southern Illinois-Carbondale  
Kathryn Northcut, Ph.D., Texas Tech University

## Bachelor of Science Technical Communication

### FRESHMAN YEAR

First Semester	Credit
English 20-Exposition & Argumentation	.3
Math 4-College Algebra	.3
Psychology 50-General Psychology	.3
IST 51-Visual Basic	.3
Humanities, Art, Music, Theater	.3
	<u>15</u>

Second Semester	Credit
Tch Com 65-Technical Writer in Bus & Indus.	.3
BioSci 110, 231, 235, or 251	.3
History 175, 176, 111, or 112	.3
IST 151-Java	.3
Econ 121-Microeconomics	.3
	<u>15</u>

### SOPHOMORE YEAR

First Semester	Credit
Speech&Media 85-Principles of Speech	.3
English-Literature	.3
Tch Com 240-Layout and Design	.3
English 281-Theory of Written Comm.	.3
IST 141-Information Systems	.3
	<u>15</u>

Second Semester	Credit
Humanities, Art, Music, Theater	.3
Political Science 90-American Govt.	.3
Tch Com 260-Practicum in Technical Communication	.3
Tch Com Elective	.3
Physical Science	.3
IST 211-Web Design	.3
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### JUNIOR YEAR

First Semester	Credit
Speech&Media 181-Theory of Comm.	.3
IST 221, 233, 241, 223, or 243	.3
Math/Statistics	.3
Psychology 307, 311, 314, 315, 372, or 374	.3
Tch Com 302-Research Methods	.3
	<u>15</u>

Second Semester	Credit
Tch Com 340-Theory of Visual TCom	.3
Speech&Media 235, 250, or 283.	.3
Tch Com Elective	.3
Tch Com Elective	.3
Psychology 307, 311, 314, 315, 372, or 374	.3
Free Elective	.3
	<u>18</u>

### SENIOR YEAR

First Semester	Credit
History 270, 274, or 275.	.3
Tch Com Elective	.3
Philosophy 25, 35, 212, 320, 350	.3
Free Elective	.3
Free Elective	.3
	<u>15</u>

Second Semester	Credit
Tch Com 385-Capstone.	.3
History or Psychology elective	.3
Tch Com Elective	.3

Free Elective . . . . . 3  
 Free Elective . . . . . 3  
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**Technical Communication  
 Minor Curriculum**

To complete this minor students must take Technical Communication 65, 240, and 260 plus six additional hours elected from the 300 level technical communication courses.

**Technical Communication Courses**

- 65 The Technical Writer in Business and Industry** (LEC 3.0) Introduction to the role of the professional technical communicator in business and industry and practice in methods of developing technical documents. Prerequisite: English 20. (Co-listed with English 65)
- 240 Layout and Design** (LEC 3.0) Theory and practice of layout and design for print and electronic media. Prerequisite: TCH COM 65 or English 65. (Co-listed with English 240)
- 260 Practicum in Technical Communication** (LEC 3.0) Practice in writing, editing, and designing layouts of technical publications using the personal computer for desktop publication. Prerequisites: TCH COM 65 and TCH COM 240, or English 65 and English 240. (Co-listed with English 260)
- 300 Special Problems** (IND 0.0-6.0) Problems or readings on specific subjects or projects in the department. Consent of instructor required.
- 301 Special Topics** (Variable 0.0-6.0) This course is designed to give the department an opportunity to test a new course. Variable title.
- 302 Research Methods in Technical Communication** (LEC 3.0) Students learn essential research methods in technical communication, including audience analysis, interviewing techniques, working with subject matter experts, and experimental research design. Prerequisites: TCH COM 65 AND TCH COM 240 or English 65 and English 240.
- 310 Seminar** (RSD 0.0-6.0) Discussion of current topics. Prerequisite: TCH COM 65 and TCH COM 240.
- 331 Technical Editing** (LEC 3.0) The principles and practices of technical editing, including usability, audience analysis, contextual editing, the conventions of scientific and technical communication, and the role of the editor in document development and publication. Students will also learn standard practices of copy editing and the use of style guides. Prerequisites: TCH COM 65 AND TCH COM 240.
- 340 Theory of Visual Technical Communication** (LEC 3.0) A study of the relationships between visual and conceptual elements of technical communication. Prerequisites: TCH COM 65 and TCH COM 240 or English 65 and English 240.
- 361 History of Technical Communication** (LEC 3.0) Introduction to the roles of the technical communicator and the technologies of communi-

cation from ancient cultures to the present. Prerequisites: TCH COM 65 and TCH COM 240.

- 380 Internship** (IND 0.0-6.0) Internship will involve students applying critical thinking skills and discipline specific knowledge in a work setting based on a project designed by the advisor and employee. Activities will vary depending on the student's background and the setting. Prerequisites: Senior status; must have completed 24 hours in the major core curriculum.
- 385 Theory and Practice of Technical Communication** (LEC 3.0) This capstone course enables the student to work on individual and group projects that put into play the theories and practices of technical communication. Students are expected to develop professional portfolios. Prerequisites: Senior Status and TCH COM 65 and TCH COM 240 or English 65 and English 240.

**Theatre**

The UMR Theatre Program offers courses in theatre production and performance, theatre appreciation, and special projects. The University Theatre presents a major production of a play, operetta, or musical each semester. You are encouraged to participate as a performer, technician or production assistant.

Recent productions have included, *The Imaginary Invalid* by Moliere, *A Funny Thing Happened on the Way to the Forum* by Larry Gelbart, *The Odd Couple* by Neil Simon, *Joseph and the Amazing Technicolor Dreamcoat* by Webber and Rice, *My Fair Lady* by Lerner & Loewe, *The Liar* by Carlo Goldoni, *Camalot* by Lerner & Loewe, *The Foreigner* by Larry Shue, *Annie Get Your Gun* by Irving Berlin, *Harvey* by Mary Chase, and *Footloose* by Dean Pitchford.

**Faculty**

**Instructor:**  
 John Woodfin, M.A., Southwest Mo. State University

**Theatre Courses**

- 42 Stage Productions, Performers** (LAB 1.0) Performers; participants selected by audition. A skills course, not a humanities elective. Prerequisite: Participants selected by audition.
- 43 Stage Productions, Technicians** (LAB 1.0) Technicians and production assistants; participants selected by interview. A skills course, not a humanities elective.
- 90 Theatre Appreciation** (LEC 3.0) A survey of technical and artistic developments in theatre in Western Civilization.
- 100 Special Problems** (IND 0.0-6.0) Problems or readings on specific subjects or projects in the department. Consent of instructor required.
- 101 Special Topics** (Variable 0.0-6.0) This course is designed to give the department an opportunity to test a new course. Variable title.

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- 200 **Special Problems** (IND 0.0-6.0) Problems or readings on specific subjects or projects in the department. Consent of instructor required.
- 201 **Special Topics** (Variable 0.0-6.0) This course is designed to give the department an opportunity to test a new course. Variable title.
- 220 **Theatre Ensemble** (LAB 1.0) This course offers the opportunity for a student to develop imagination and performance abilities through improvisation, clowning, readers theatre, exercises, mime; emphasis varies. Members selected by interview/audition. A skills course, not a humanities elective.
- 300 **Special Problems** (IND 0.0-6.0) Problems or readings on specific subjects or projects in the department. Consent of instructor required.
- 301 **Special Topics** (Variable 0.0-6.0) This course is designed to give the department an opportunity to test a new course. Variable title.