

# COLLEGE OF LIBERAL ARTS AND SCIENCES

Claire Etaugh,  
Dean

Jerome Hahn,  
Associate Dean

The mission of the College of Liberal Arts Sciences is to:

1. Provide an environment for students to develop an awareness of the great issues facing humanity.
2. Encourage students to be imaginative, critical, intellectually curious individuals, who will aspire to life-long learning.
3. Develop career interests and abilities appropriate to the needs of the students.
4. Foster in students communicative and evaluative competencies. Develop self-renewing people in a value-centered interdisciplinary, intercultural, and humanistic context that puts career goals of students into a societal context in ways that will have significant impact on contemporary and future society, and will bring continuing personal satisfaction to them.

## Biology

Barbara A. Frase,  
Graduate Advisor

A student desiring a Master of Science in biology will need to complete 32 semester hours of graduate work. A minimum of 26 hours will be in biology; the remaining hours may include cognate courses (e.g. in education, psychology, or computer science) approved by the graduate advisor. Twelve hours must be taken at the 600 level. A research thesis is required; a student must enroll in at least three hours of thesis (BIO 699).

In the student's first year, a committee of three members of the graduate faculty (including the thesis advisor) will be chosen in consultation with the graduate advisor; this committee will advise and assist the student in his or her thesis work. The student must submit a thesis proposal to the committee for approval prior to enrolling in BIO 699 (thesis).

Upon completion of the thesis, a student will usually present a departmental seminar. The student must pass an oral comprehensive exam and successfully defend the thesis to the committee members.

## Course Descriptions

### **BIO 501 Biology of Fishes**

**3 hrs.**

Fishes: organ-system structure and function, ecology, embryology, behavior, and economic importance. Prerequisites: BIO 312 or 323 or consent of instructor.

### **BIO 506 Advanced Microbiology**

**3 hrs.**

Comprehensive analysis of selected topics of current interest in bacteriology, immunology, and virology: genetic engineering, plasmid research, bactericidal and bacteriostatic agents, complement system, viruses,

tumor formation, and cancer. Prerequisites: one semester of laboratory bacteriology; organic chemistry; or consent of instructor.

**BIO 508 Enzyme Chemistry**

**3 hrs.**

Enzymes: kinetics, structure, specificity, reaction mechanisms, inhibition, and regulation. Cross listed as CHM 508. Prerequisites: 2 semesters of organic chemistry; one semester of differential and integral calculus; introductory biochemistry; or consent of instructor.

**BIO 509 Human Genetics**

**3 hrs.**

Genetic theory and methodology applied to humans. Prerequisites: BIO 224 or consent of instructor.

**BIO 510 Population and Evolutionary Ecology**

**3 hrs.**

Emphasis on structure, growth patterns, and interactions of populations; relationship to evolutionary theory. Prerequisites: MTH 115; one semester of environmental biology or consent of instructor.

**BIO 519 Comparative Animal Behavior**

**3 hrs.**

Animal communication, social behavior, and evolution of behavior. Comparisons of a wide variety of vertebrates and invertebrates. Prerequisites: 6 hours of college level biology or zoology.

**BIO 525 Advanced Physiology**

**3 hrs.**

Detailed study of the structure and function of animals; special reference to the human body; theories and methods of investigation mostly at organ system level; adaptational strategies to special conditions. Prerequisite: one semester of physiology or consent of instructor.

**BIO 530 Plant Systematics**

**3 hrs.**

Evolution, classification, and characteristics of various flowering plant families. Prerequisites: one semester of plant systematics or consent of instructor.

**BIO 545 Biophysics**

**3 hrs.**

Applications of physics principles and methods of investigation of biological systems. Emphasis on physical environmental effects on biological systems. Cross listed as PHY 545. Prerequisites: PHY 108 or 201; senior standing; or consent of instructor. PHY 345 recommended.

**BIO 561 Natural History of Vertebrates**

**3 hrs.**

Vertebrates as integrated organisms: emphasis on activities and interaction with environment under natural conditions. Field work on local fauna. Introduction to classification. Prerequisite: 6 hours of college level biology or zoology.

**BIO 563 Advanced Plant Ecology**

**3 hrs.**

Physiological and growth responses of plants to environmental stresses, and consequences to the structure and function of communities and ecosystems. Prerequisites: CHM 250; 1 plant biology course, 1 ecology course, or consent of instructor.

**BIO 564 Advanced Molecular Biology**

**3 hrs.**

Selected topics in molecular biology. Emphasis on proteins and nucleic acids. Prerequisites: BIO 365 or consent of instructor.

**BIO 565 Aquatic Ecology**

**3 hrs.**

Emphasis on survival and dispersion of natural aquatic populations as related to environmental degradation in lakes, rivers, and streams. Prerequisites: one semester of environmental biology or consent of instructor.

**BIO 566 Advanced Biochemistry**

**3 hrs.**

Quantitative aspects of all areas of biochemistry. Emphasis on metabolism. Prerequisite: one semester of biochemistry or physical chemistry, or consent of instructor.

**BIO 570 Seminar**

**1-3 hrs.**

Selected topics in biological sciences. May be repeated under different topics for a maximum of 6 hours credit. Prerequisites: 3.0 gradepoint average in student's major; senior or graduate standing; consent of instructor.

**BIO 580 Readings**

**1-3 hrs.**

Individual assignments of relevant topics in biological sciences. Prerequisites: 3.0 gradepoint average in student's major; senior or graduate standing; consent of instructor.

**BIO 585 Research**

**1-6 hrs.**

Individual research for qualified students in special areas of biology. Prerequisites: 3.0 gradepoint average in student's major; senior or graduate standing; consent of instructor.

**BIO 681 Readings**

**1-6 hrs.**

Readings in an area of interest to the student. Prerequisites: graduate standing and consent of instructor.

**BIO 683 Research**

**1-6 hrs.**

Research in an area of interest to the student. Prerequisites: graduate standing and consent of advisor.

**BIO 699 Thesis**

**1-6 hrs.**

Research and thesis preparation. Repeatable for up to 6 hours credit. A student can receive no more than a total of 6 hours credit in BIO 699 or CHM 699 or PHY 699. Prerequisite: consent of program coordinator.

# Chemistry

Kurt W. Field,  
Graduate Advisor

The Department of Chemistry has long offered a Master of Science degree in chemistry. The program is designed for students who are locally employed and wish to advance their knowledge and professional careers by taking advanced work in chemistry and related disciplines. Most courses are offered in the late afternoon or evening. Candidates for the M.S. degree must take a minimum of 30 semester hours in chemistry and related subjects. Of these hours, 6 semester hours must be devoted to original research. A publishable thesis is required for graduation based on this research. Of the remaining 24 semester hours, up to a maximum of 12 semester hours may be taken at the graduate level in cognate fields such as engineering, education, mathematics, business or biology. Individual programs are developed in conference between the student and the advisor.

## Course Descriptions

### CHM 500 Chemical Topics

1-3 hrs.

Topics of special interest which may vary each time course is offered. Topic stated in current Academic Handbook. Prerequisite: CHM 351, 461.

### CHM 508 Enzyme Chemistry

3 hrs.

Enzymes: kinetics, structure, specificity, reaction mechanisms, inhibition, and regulation. Cross listed as BIO 508. Prerequisites: two semesters of organic chemistry; one semester of differential and integral calculus; introductory biochemistry; or consent of instructor.

### CHM 509 Advanced Inorganic Chemistry

3 hrs.

Theoretical-descriptive approach to inorganic chemistry. Emphasis on dependence of selected chemical and physical characteristics of elements and compounds on extranuclear structure. Prerequisites: CHM 320, 461.

### CHM 510 Advanced Inorganic Chemistry Laboratory

1 hr.

Laboratory work in inorganic chemistry. Prerequisite: CHM 509 or concurrent enrollment.

### CHM 530 Advanced Analytical Chemistry

4 hrs.

Theory and applications of modern qualitative, quantitative, and instrumental methods. Prerequisite: CHM 320, 462.

### CHM 550 Industrial Organic Chemistry

1 hr.

Survey of modern industrial organic chemistry; emphasis on petroleum derivatives. Prerequisite: one year of organic chemistry.

### CHM 551 Advanced Organic Chemistry

3 hrs.

Organic reactions and reaction mechanisms.

Prerequisite: CHM 351.

### CHM 553 Qualitative Organic Analysis

4 hrs.

Laboratory: systematic identification of pure organic compounds; analysis of mixtures. Prerequisites: CHM 320, 351, 392.

### CHM 630 Advanced Chemical Instrumental Analysis

3 hrs.

Modern chemical instrumental analysis: theory of operation of instruments and related chemical theory. Lecture and laboratory. Prerequisite: CHM 530.

### CHM 652 Advanced Organic Chemistry

3 hrs.

Theoretical aspects of organic chemistry: stereoisomerism, conformational analysis, molecular rearrangements, and electronic interpretations of organic reactions. Prerequisite: CHM 551.

### CHM 655 Carbohydrates

3 hrs.

Simple sugars and certain polysaccharides: determination of structure, stereochemistry, typical chemical transformation, identifications, and physiological importance. Prerequisites: 8 hours of organic chemistry; consent of instructor.

### CHM 658 Macromolecules

3 hrs.

Physical and chemical aspects of synthetic and natural polymers. Prerequisites: CHM 351, 462.

### CHM 671 Reading in Chemistry

1-6 hrs. total

Directed reading for qualified students. Maximum of 3 hrs. per semester. Prerequisite: CHM 509 or 551.

### CHM 681 Fermentation Biochemistry

3 hrs.

Microbial metabolism, particularly in fermentation processes. Emphasis on biochemistry of enzyme catalyzed reactions. Prerequisite: consent of instructor.

### CHM 683 Research

1-6 hrs.

Required of all candidates for the Master of Science degree in chemistry. Prerequisite: accepted thesis proposal.

### CHM 699 Thesis

1-6 hrs.

Research and thesis preparation. Open to students in the MNS program only. Repeatable for up to 6 hours credit. A student can receive no more than a total of 6 hours credit in BIO 699 or CHM 699 or PHY 699. Prerequisite: consent of program coordinator.

# Computer Science and Information Systems

Jiang B. Liu,  
Graduate Advisor

The Department offers graduate programs leading to the degrees of Master of Science in computer science and Master of Science in computer information systems. These courses of study are designed to prepare students for professional careers in the field of computing and information processing or for further study and research.

Computer scientists are developers of basic computer technology such as operating systems, language translators, data management software and other programming, processing, and operating aides to be used in conjunction with computer hardware. They are usually employed by computer manufacturers and software houses specializing in systems software. Computer information systems specialists are principally users of computer technology, usually in systems projects for applications in business, industry, or government.

In addition to satisfying all the Graduate School requirements for the degree, all candidates for the master's degree must satisfy the following departmental requirements:

1. At least 36 hours of graduate-level coursework.
2. No "D" grades can be counted in the completion of requirements for the degree.
3. Every student must pass a written comprehensive examination that will be based on the core requirements for the program pursued.
4. The Department of Computer Science and Information Systems has instituted a programming examination which all its graduate students must pass as part of their degree requirements. It is to be administered before the student has completed nine hours of graduate work. The students who fail are advised to take appropriate undergraduate courses before attempting the exam again. Students are to be given three opportunities to pass the examination. It is given early in the program in order to function as an effective diagnostic.

Interested and qualified students are offered the option of writing a master's thesis. Students selecting this option are encouraged to choose an advisor and topic as early as possible in order to plan the thesis development and any needed supporting coursework. The following policies apply to theses:

1. A minimum grade point average of 3.5 in computer science and computer information systems graduate courses is required for students enrolling in CS 699 (Thesis).
2. No student may register for CS 699 until 18 hours of graduate courses have been completed in the department.

3. Six credit hours of CS 699 are required and, upon completion, the thesis must be defended in an oral examination. No grade will be given for CS 699 until after the oral defense.
4. A written outline of the thesis project and a tentative schedule must be submitted to and approved by the graduate advisor and the chair prior to the registration for CS 699.

Admission requirements and graduation requirements specific to computer science and computer information systems are given below. Note that prospective students who do not meet the conditions for admission may be admitted conditionally, in which case the department will prescribe a program for the removal of such admission conditions. Conditional status must be removed prior to graduation.

## Computer Science

In addition to meeting all the general requirements of the Graduate School and of the department as stated above, candidates for the master's degree in computer science must satisfy the following requirements.

1. At least 30 of the 36 hours required must be in computer science courses. At most, six hours may be earned in approved courses other than those labeled CS.
2. The following core requirements must be satisfied (either by taking the course or showing evidence of the completion of an equivalent course elsewhere): CS 503 or CS 615, CS 516, CS 517, CS 519, CS 550 or CS 643, CS 682, CS 609, CS 521 or CS 514.
3. Two of the following two-courses sequences must be completed: CS 517 and CS 518, CS 615 and CS 616, CS 514 and CS 614, CS 521 and CS 522, CS 530 and CS 550, CS 510 and CS 511, CS 519 and CS 570.

For admission into the computer science program, a student must have completed discrete mathematics, at least two semesters of calculus, matrix or linear algebra, and at least one semester of calculus-based statistics; must have at least 15 hours of computer science coursework including knowledge of one structured programming language such as C/C++, elementary data structures, assembly language, advanced data structures, and introductory computer architecture; and must have approval of the Department.

## Computer Information Systems

In addition to meeting all the general requirements of the Graduate School and of the department as stated above, candidates for the master's degree in computer information systems must satisfy the following requirements:

1. At least 21 of the 36 hours required must be in computer information systems or computer science courses.
2. A minimum of 12 hours must be taken in courses outside the department. These courses must form a coherent program in an applications area and must be approved by the graduate advisor.

3. The following core requirements must be met (either by taking the course or by showing evidence of having completed an equivalent course elsewhere): CIS 571, CIS 572, CIS 588, CIS 607, CIS 608, and CS 609. (CS 615 and CS 643 are recommended).

The admission requirements for the computer information systems program are one semester of calculus, one semester of calculus-based statistics, two semesters of accounting, one semester of finance, two semesters of programming and data structures in a structured programming language such as C/C++, and one semester of data communications.

## Course Descriptions

### Computer Information Systems

#### **CIS 571 Computer Law** **3 hrs.**

Ethical considerations of computer scientists and computer-related security and privacy issues; copyright, patent, trademark, and trade secret issues, deceptive trade practices, computer crime, contract issues, venture capitalists, tax issues, computer torts, constitutional issues, and international trade considerations. Prerequisite: one semester of programming.

#### **CIS 572 Computing Services Management** **3 hrs.**

Management of computing resources: planning for computing services; operational considerations; evaluation of service. Prerequisites: CS 302 or 310.

#### **CIS 588 Introduction to Expert Systems** **3 hrs.**

Knowledge-based systems design and implementation; expert systems shells and programming environments; validation and implementation of expert systems: case studies/laboratories. Cross listed as IE 588. Prerequisites: two semesters of programming and one semester of statistics, or consent of instructor.

#### **CIS 606 Software Systems Design** **3 hrs.**

Planning, writing, debugging, and documenting large software systems. Consult with instructor for details on programming language to be used. Prerequisites: CS 121; consent of instructor.

#### **CIS 607 File Organization and Management** **3 hrs.**

File organizations and access methods. Sort/merge operations; hashing schemes for storage and retrieval. Projects involve data validation; creation and updating of files; simulation and/or implementation of direct and indexed files. Prerequisite: CS 121 or equivalent.

#### **CIS 608 System Specification and Development** **3 hrs.**

Techniques and tools of system specification and development. Case studies; problems. Prerequisite: CS 302 or 310.

## Computer Science

#### **CS 500 Multimedia, Internet, and Applications** **3 hrs.**

Human and computer interaction; Internet and the World Wide Web; hypertext, design and building of multimedia systems; forms and interactive applications on the Web with Common Gateway Interface (CGI) scripting and PERL; Java and VRML. Prerequisites: 24 semester hours in mathematics, logic, science, and technology courses, including at least 6 hours of CS.

#### **CS 503 Programming Methodology** **3 hrs.**

Predicate calculus, Dijkstra's methodology of algorithm development. Algorithm development. Algorithmic language characteristics; syntax, semantics. Postconditions and preconditions. Verification of postcondition states satisfied by algorithmic programs executed from preconditions. Problems. Prerequisites: MTH 120, 302.

#### **CS 505 Advanced Topics in Databases** **3 hrs.**

Current trends in information technology. Hypertext navigation, intelligent navigation with expert systems and neural nets, multimedia, text management and retrieval, deductive and object-oriented databases, distributed databases, the integrated intelligent database.

#### **CS 510 Numerical Methods I** **3 hrs.**

Introduction to numerical and computational aspects of various mathematical topics: finite precision, solutions to nonlinear equations, interpolation, approximation, linear systems of equations, and integration. Cross listed as MTH 510. Prerequisites: CS 104 or 106; MTH 207 and 223.

#### **CS 511 Numerical Methods II** **3 hrs.**

Continuation of CS/MTH 510: further techniques of integration, ordinary differential equations, numerical linear algebra, nonlinear systems of equations, boundary value problems, and optimization. Cross listed as MTH 511. Prerequisites: MTH 224 or 345; CS/MTH 510.

#### **CS 514 Algorithms** **3 hrs.**

Design and analysis of algorithms. Dynamic structures maintenance and hashing. Searching, sorting, and traversal. Time and space requirements; simplification; computational complexity; proof theory and testing; NP-hard and NP-complete problems. Prerequisites: CS 302; MTH 325 or IE 311 or BMA 262.

#### **CS 516 Programming Languages** **3 hrs.**

Design concepts of high-level languages. Description languages; grammars and syntax; expressions and data structures; selection and control structures; constructs for input and output; subprograms and parameter communications. Prerequisite: CS 302 or 310.

**CS 517 Translator Systems I (Assemblers and Parsing)**  
**3 hrs.**

Introduction to programming language translation: assembly language translation; parsing methods for high level languages. Prerequisite: CS 206. Co-requisite: CS 516.

**CS 518 Translator Systems II (Compilation)****3 hrs.**

Continuation of CS 517: code generation, error recovery, optimization, interpretation, and threaded interpreted languages. Prerequisite: CS 517.

**CS 519 Introduction to Operating Systems****3 hrs.**

Design principles of software for operation of computers. Storage, processor, device, and file management as an integrated system; input/output control. Prerequisite: CS 206.

**CS 521 Introduction to Artificial Intelligence****3 hrs.**

Basic concepts and techniques of artificial intelligence: philosophical considerations, examples, pattern recognition, search strategies, game playing, knowledge representation, logic and resolution, planning, vision, natural language processing, programming in LISP. Prerequisites: CS 302 or consent of instructor.

**CS 522 Neural Networks, Knowledge-based Systems, and Applications****3 hrs.**

Theorem proving, logic programming, expert systems, uncertainty, fuzzy logic, machine learning, neural networks, programming in PROLOG. Prerequisites: CS 302 and one course in statistics or consent of instructor.

**CS 530 Microcomputer Systems****3 hrs.**

Review of microcomputer architecture. Bus structures; examples. Operating systems concepts. Practical use of a microcomputer in client/server environment. Prerequisite: CS 206 or consent of instructor.

**CS 535 Introduction to Computer Graphics****3 hrs.**

Mathematics and algorithms of computer graphics. Device differences, lines, arcs, curves, transformations, input and output primitives. Data structures for geometric entities. Prerequisites: MTH 207, 223; CS 302.

**CS 550 Advanced Computer Architecture****3 hrs.**

Fundamental computer sub-systems: central processing unit; memory systems; control and input-output units. General purpose computing systems design. Examples from existing typical computers. Prerequisite: CS 350.

**CS 570 Systems Performance and Modeling****3 hrs.**

Techniques of modeling processes and the resources they share: intuitive, simulation, and analytical approaches. Performance prediction, bench marking, and synthetic loading. Prerequisites: CS 310 or 302; one semester or calculus-based statistics.

**CS 609 Database Management Systems****3 hrs.**

Relational, hierarchical, and network database models. Conceptual and physical schema. Data definition and

data manipulation languages. Normal forms and database design. Database administration, security, integrity, and backup recovery. Query optimization. Latest developments in databases. Prerequisite: CIS 607 or equivalent; or consent of instructor.

**CS 610 Advanced Topics****3 hrs.**

Special projects under staff supervision on advanced problems in numerical or nonnumerical branches of computer science. May be taken more than once under different topics. Prerequisite: consent of instructor.

**CS 611 Directed Individual Studies****1-3 hrs.**

Individual study in an area of computer science relevant to the student's professional goals and not covered in a formal course offered by the department. May be repeated twice for a maximum of 6 hours credit. Prerequisites: consent of the department chair and instructor.

**CS 614 Parallel Algorithms****3 hrs.**

Parallel algorithms for multi-processor computer architectures: concurrent programming, SIMD and MIMD systems, and time complexity. Prerequisite: CS 514 or concurrent enrollment.

**CS 615 Software Engineering I****3 hrs.**

Software engineering: technical management; project management, estimation, and control; economics; environments; standards; products and their phases. Prerequisites: CS 503, 608.

**CS 616 Software Engineering II****3 hrs.**

Background and overview of software production: requirements for engineering and analysis; software specifications, design, coding, qualification, manufacture, support, and standards. Emphasis on a specific topic in software engineering. Prerequisites: CS 503, 608.

**CS 643 Data Communications and Distributed****Computing****3 hrs.**

Introduction to communication technologies. Emphasis on application to computer networks, information and coding theory, design considerations, and architecture, including topologies, implementation techniques, and standard distributed computing architectures. Prerequisites: MTH 120, 325; CS 519.

**CS 682 Theory of Computation****3 hrs.**

Theory of formal languages and computability. Automata, turing machines, grammars. Context-free and context-sensitive languages; parsing. Recursion theory: limits of effective computability. Unsolvability, reducibility, complexity. Prerequisites: MTH 120, CS 320; or consent of instructor.

**CS 699 Thesis****3-6 hrs.**

Computer science research and thesis preparation. Required of candidates choosing the thesis option. Total of 6 semester hrs. to be taken in one or two semesters. Prerequisite: consent of department chair.

# English

Robert Prescott  
Graduate Studies Coordinator

The Master of Arts in English provides post-baccalaureate students with study in the theory and practice of English. It is intended to prepare students for professional advancement and for further study in either literature or writing. The literature track emphasizes the study of literary texts with related study of writing, theory, and methods. The literature track also requires an internship within the context of an undergraduate literature course, a portfolio of written work, and a written comprehensive exam over selected work taken in the program. The writing track emphasizes the study and practice of writing with related study of literature, theory, and methods. The writing track also requires an internship within the context of an undergraduate writing course, a portfolio of written work, and a written comprehensive exam over selected work taken in the program.

Because the master's program is predicated upon the complementary relationship between theory and practice in the study of English, both tracks of the program require ENG 500 Theory and Practice of English, another course in theory, and the internship. Students in either program not only will become familiar with the aesthetic, formal, and theoretical underpinnings of their field of study, but also will learn how to address their audiences by means of professional discourse. In this way, the Master of Arts in English focuses on ways candidates for the degree may enhance their professional lives and communicate to others their understanding of the uses of the discipline in the classroom and the workplace.

## Special Admission Requirements

In addition to the admission requirements of the Graduate School, the applicant shall present the following material with the application:

1. An essay of under 1500 words stating what the applicant expects to achieve from the study of English (literature or writing) at the master's level.
2. A writing sample (professional, critical, creative) that the applicant deems to be representative of the quality of his or her work. The sample may be an undergraduate paper, professional work, or work prepared for personal use. (The sample will not be returned. Submit a copy.)
3. Two letters of recommendation from references whose discipline is English literature or writing or from employers who have experience in the field of literature or writing. For those applicants who no longer have contact with either, the recommendations should be from those who can comment on the applicant's ability to benefit from a graduate program in English.

## Programs of Study

### Literature Emphasis Requirement

Theory and Practice of English .....	3 hrs.
Language Theory or Writing Theory or Literary Criticism .....	3 hrs.
American or English Periods .....	6 hrs.
Selected Authors/Genres .....	6 hrs.
Internship in Literature .....	3 hrs.

### Writing Emphasis Requirement

Theory and Practice of English .....	3 hrs.
Writing in the Professions and/or Workshop for Writers and/or Creative Non-Fiction .....	6 hrs.
Language Theory or Writing Theory or Literary Criticism .....	3 hrs.
Literature Courses .....	6 hrs.
Internship in Writing .....	3 hrs.

To complete either 30-hour program, students elect 3 courses (9 credits) from literature, writing, theory, or independent study.

## Course Descriptions

### ENG 500 Theory and Practice of English 3 hrs.

Overview of the practices, theories, and history of the field of English and an introduction to the Bradley program. Required of all graduate students. Must be taken in first nine hours.

### ENG 503 Creative Non-Fiction 3 hrs.

Practice in writing non-fiction genres, such as autobiography, biography, nature writing, and travel writing. Prerequisite: submission to instructor of an acceptable manuscript.

### ENG 506 Writing in the Professions 3 hrs.

Study and practice of the writing conventions and rhetorical characteristics of individual professions.

### ENG 507 Workshop for Writers 3 hrs.

Individual guidance in creative writing projects. May be repeated for a maximum of six hours credit. Prerequisite: consent of instructor, after submission of an acceptable manuscript.

### ENG 550 Language Theory 3 hrs.

Study of the relationships between language and writing, thinking, and society. Prerequisite: senior or graduate standing.

### ENG 560 Writing Theory 3 hrs.

Theoretical approaches to the study of writing. Prerequisite: senior or graduate standing.

### ENG 570 Contemporary Literary Criticism 3 hrs.

Advanced study of contemporary critical approaches to literature, including, but not limited to, feminism, semiotics, cultural criticism, post structuralism. Study of the critical theories and applications of the criticisms to literary texts.

**ENG 580 Theories and Methods of Teaching Composition**  
**3 hrs.**

Theoretical and pedagogical issues and approaches in teaching composition.

**ENG 630 American Periods**  
**3 hrs.**

Study of selected periods or movements from the 17th century to the present. May be repeated under a different topic for a maximum of six hours credit.

**ENG 640 English Periods**  
**3 hrs.**

Study of selected periods or movements from the 7th century to the present. May be repeated under a different topic for a maximum of six hours credit.

**ENG 650 Selected Authors**  
**3 hrs.**

Study of one or two authors who write in English. May be repeated under different authors for a maximum of six hours credit.

**ENG 660 Genres**  
**3 hrs.**

Study of a single genre: fiction, prose, poetry, or drama. May be repeated under a different genre for a maximum of six hours credit.

**ENG 690 Internship in Literature**  
**3 hrs.**

Theory, analysis, and practice of literature within the context of an undergraduate literature course. Prerequisites: 21 hrs. English graduate courses.

**ENG 691 Internship in Writing**  
**3 hrs.**

Theory, analysis, and practice of writing within the context of an undergraduate composition class. Prerequisite: 21 hrs. English graduate courses.

**ENG 695 Independent Study**  
**3 hrs.**

Independent research in literature, writing, or theory.

**ENG 699 Thesis**  
**3-6 hrs.**

Independent research. Three hours required in the first program (traditional M.A.). Prerequisite: consent of department chair.

# Liberal Studies

Max Taylor  
Acting Director, Liberal Studies Program

## Definition and Purpose

The purpose of the Master of Liberal Studies program is to provide motivated adults with opportunities to continue intellectual growth by integrating knowledge and perspectives from different disciplines in an innovative and challenging manner. The program introduces students to the pleasures and principles of science, the arts, technology, business, and the humanities as a means of exploring the problems and possibilities of life in modern society.

The program is designed for the adult student who wants a flexible part-time program offered during evening and weekend hours. Courses in the program bring Bradley's most distinguished faculty together with practitioners of business, education, law, medicine, journalism, and others who seek to understand the most controversial issues of the age and to extend their intellectual knowledge and vision.

## Special Regulations

The M.L.S. degree meets the standards and policies of the Graduate School of Bradley University. But as with other programs, it has its own curriculum and integrity which require special regulations.

### Admission

Admission to the M.L.S. program is limited to those who qualify for unconditional admission to the Graduate School. A personal letter of intent and an interview will be required in addition to the customary transcript and two recommendations.

### Course Requirements

All work must be on the 600 level in M.L.S. courses. Thirty semester hours are required for the degree.

### Transfer of Credit

The M.L.S. program ordinarily does not allow for transfer of credit. However, the Dean of Liberal Arts and Sciences will act on individual petitions.

### Colloquium

In the final semester of the program, the candidate will participate in a colloquium with members of the M.L.S. faculty. The M.L.S. faculty in cooperation with each candidate shall devise the colloquium.

## Course Descriptions

**MLS 601 Physical Science Concepts and Society**  
**3 hrs.**

Great concepts of modern physical science and their impact on society. The scientists and their creative insights; influence of governmental policies on science.

**MLS 602 Physics: Resonance With Reality****3 hrs.**

Influence of historical and cultural notions (such as the world being organism, pure number, and total harmony) on creative minds of the West, and how these notions are enmeshed in modern physics theories and developments.

**MLS 603 Origins, Structure, and Dependability of Information****3 hrs.**

Eastern and Western attitudes in the 20th Century concerning the source, nature, and accuracy of human knowledge. Analysis of artistic creativity, psychological experiments of left and right hemispheric brain activity, and methods of scientific discovery.

**MLS 604 Philosophical Foundations and Law****3 hrs.**

"Law" as an idea and as seen from a general perspective. Existing and proposed laws are explored in terms of underlying, fundamental considerations to develop a meaningful concept of law in the context of the student's own life.

**MLS 605 A Philosophical Description of the Human Condition****3 hrs.**

A rigorous investigation of our presuppositions about what a "better" way of being human should be, in context of developments in the life sciences that allow persons to alter or modify their own nature.

**MLS 606 The Development of Social Thought****3 hrs.**

Survey of theoretical perspectives for critical social science; emphasis on classic socio-economic thought of the 19th and 20th century. Construction of a theoretical framework for critical analysis of late industrial societies. Importance of Marxian theory to analyses of cultural forms and quality of everyday life. Relation of thought and social structures; doctrine of ideology; social organization of scientific and intellectual activities; processes of bureaucratization, rationalization, and alienation; social status; the role of intellectual activity in processes of revolution and social criticism.

**MLS 608 American Egalitarianism and Mass Education****3 hrs.**

Investigation of the ambivalence in American culture and educational philosophy between commitment to mass education as a force for democratization and suspicion of the educated as fostering an undemocratic elitism. The effects of this ambivalence on American education.

**MLS 609 Popular Music and Poetry in the Twentieth Century****3 hrs.**

Techniques and broad historical outlines of all forms of twentieth century music and poetry. Emphasis on the inter-relatedness of the two arts, and on familiar popular forms. Practice writing, analyzing, and criticizing popular music and poetry.

**MLS 610 Weimar Germany: Culture and Politics Before Hitler****3 hrs.**

Interdisciplinary, conceptual study of the profound changes that shaped the evolution of Weimar Germany. The disintegration of the values of old Germany, post-World War I alienation, and Weimar political and economic chaos as contrasted with the enormous creativity that brought forward exciting developments in art, film, architecture, science, literature, and popular culture.

**MLS 611 Contemporary World Issues****3 hrs.**

Sophisticated analysis of major contemporary international issues such as relations among industrial societies, the North-South dialogue, nationalism, and global economic problems. No more than four issues will be explored in depth in any one semester.

Prerequisite: graduate standing.

**MLS 612 Perspectives on United States International Relations****3 hrs.**

In-depth analysis of United States foreign relations from North American, European, Asian, African, and Latin American perspectives. Prerequisite: graduate standing.

**MLS 613 The Energy Situation: An Overview****3 hrs.**

In-depth study of the U.S. and world energy situation, problems and methods associated with energy production, and effects of various factors such as population on the energy problem. Technical, social, economic, political, and moral implications of the energy situation. Prerequisite: graduate standing.

**MLS 614 Cultural Dimensions of Psychological Theory****3 hrs.**

Ideological roots of psychological science in American culture. Social science understandings of the good person and the good society.

**MLS 615 Philosophy, Psychology, and Religion in the Works of William James****3 hrs.**

How William James brought together studies in psychology, philosophy, and religion to develop a comprehensive theory of human nature. James's writings as an exemplary attempt to build a model of human experience in its many and varied expressions (philosophical anthropology).

**MLS 616 Female and Male: Origins of Sex Differences in Behavior****3 hrs.**

Critical analysis of research findings and theories concerning the origin and development of differences in the behaviors of females and males; psychological, sociological, and biological factors.

**MLS 617 All Reality is Astronomy****3 hrs.**

The impact of astronomy on our present culture; our place in the cosmic environment. Planetarium scenarios and models display visually how various cultures in the past viewed our place in the universe, and also project modern cultural and cosmic views and theories. A cooperative venture with Lakeview Planetarium.

**MLS 618 Controversial Issues in Biology****3 hrs.**

A detailed examination of the important topical issues that are currently under intense debate in biology. Topics such as genetic engineering, the patenting of life forms, sperm banks, and nuclear waste disposal discussed from a scientific, political, moral, and religious point of view.

**MLS 619 Controversial Psychological Issues and Society****3 hrs.**

Topics in psychology that have stimulated heated controversy in both the professional and public arenas because of their potential impact on individuals and on society. Topics such as control of human behavior, use of psychosurgery, effectiveness of psychotherapy, effects of televised violence, and states of altered consciousness.

**MLS 620 Literature and Society****3 hrs.**

The primary "social" theories of literature; the relationships between society and literature as an institution; and literary documents themselves.

**MLS 621 Communicating Change and Innovation****3 hrs.**

Basic communication principles used in creating change and having change and innovation adopted by people and/or organizations. Practical examples used to demonstrate effective communication channels and means for getting change accepted.

**MLS 622 La Tissue Urbaine: The City as a Living Organism****3 hrs.**

Physical structure or tissue of human settlements; urban emphasis. Their physical evolution, common universal characteristics, and unique differences; their value, importance, and integrity. The ideal or utopian human settlement. Global and local examples. Prerequisite: enrollment in the M.L.S. program.

**MLS 623 Death and Dying: An Interdisciplinary Inquiry****3 hrs.**

Interdisciplinary investigation of the human experience of death. Modernism and death, religion and death, euthanasia, the mourning and bereavement process, psychoanalytic interpretation of death anxiety.

**MLS 624 The North American Frontier in Literature****3 hrs.**

Literature relating to the North American Frontier as both a body of themes and as a group of conditions surrounding literature: gender, genre, language, region, and nationalism. United States, Canadian, Colonial, and European literatures.

**MLS 625 Music and Western Society****3 hrs.**

Relationship of music to other areas of human endeavor. Basic elements of music; various beliefs and myths about music. Required concert attendance.

**MLS 626 Three Ideas That Formed Western Culture****3 hrs.**

Diagnostic examination of the origins in Greek, Hebrew, and Roman antiquity of three pillars of Western culture: Protestant Christianity, natural

science, and democratic self-government. Prerequisite: graduate standing.

**MLS 627 Religion in the Modern World****3 hrs.**

Sociological, psychological, and philosophical issues confronting religion in the late twentieth century.

**MLS 628 The Western Legal Tradition****3 hrs.**

A survey of Western legal history from the Roman Republic to the present.

**MLS 629 Critical Thinking & Reasoning****3 hrs.**

Study of critical thinking, defined as the ability to weigh evidence judiciously in making decisions. Application of the scientific method to everyday decision making. Examination of examples from a broad array of disciplines and media. Prerequisite: graduate standing.

**MLS 630 Nature Writers and Writing****3 hrs.**

Selected American nature writers from Thoreau to the present, concentrating on the cultural implications of the genre for writers, general readers, and environmentalists.

**MLS 631 Controversial Legal Issues****3 hrs.**

An analysis of controversial legal issues and the arguments that support them, with emphasis on contemporary conflicts. Prerequisite: graduate standing.

**MLS 690 Independent Study****3 hrs.**

Student pursues a topic of interest in depth under the guidance of a single instructor. Subject must naturally evolve from study undertaken in one or more courses in the student's MLS program. To be undertaken only after 21 semester hours have been completed.

## Supportive Courses

The following courses are offered by departments in liberal arts and sciences to graduate students and qualified undergraduates. Graduate students who intend to use them as an integral part of their degree program should consult both their graduate advisor and the chair of the department concerned.

### Geological Sciences (Earth Science)

#### **GES 505 Field Observation in Natural History** 4 hrs.

For non-majors: field oriented investigation of diverse topographic forms, mountain structures, and materials composing the earth. Develops understanding of rapidly deteriorating environment through observation of geophysical, astronomical, and biological variations. One week of classes; three week bus trip to marine station, and return. Not open to undergraduate geological sciences majors.

#### **GES 518 Subsurface Flow in Porous Media** 3 hrs.

Fundamentals of groundwater flow: theory of flow in anisotropic media, transient well testing techniques, analytical and computer solutions of flow problems; dispersion phenomena. Cross listed as CE 518. Prerequisites: MTH 224; senior or graduate standing in geology or civil engineering.

#### **GES 691 Directed Study in Geological Sciences** 1-4 hrs.

Projects designed to supplement departmental offerings in geological sciences. Prerequisite: consent of instructor.

### History

#### **HIS 505, 506 Seminar in Directed Reading** 1-3 hrs. each

Program of directed readings; analysis, synthesis, and interpretation of materials. Prerequisites: senior or graduate standing; 15 hrs. of college-level history with at least a B average; consent of department chair.

#### **HIS 507, 508 Area Study in Directed Reading** 1-3 hrs. each

Projects and readings in area studies; e.g. Asia, Russia, Africa, or South America. Prerequisites: 15 hours of college-level history with at least a B average; consent of department chair.

### Mathematics

#### **MTH 501 Topics in Applied Mathematics I** 3 hrs.

Theory, applications, and algorithms for basic problems of modern applied mathematics. Symmetric linear systems, minimum principles, equilibrium equations, calculus of variations, orthogonal expansions, and complex variables. Prerequisite: MTH 224 or 345.

#### **MTH 502 Topics in Applied Mathematics II** 3 hrs.

Continuation of MTH 501. Selected numerical algorithms: Fast Fourier transform, initial value problems, stability, z-transforms, and linear programming. Prerequisite: MTH 501 or consent of instructor.

#### **MTH 503 Complex Variables II** 3 hrs.

Continuation of MTH 403. Advanced topics in complex analysis. Prerequisite: MTH 403 or consent of instructor.

#### **MTH 510 Numerical Methods I** 3 hrs.

Introduction to numerical and computational aspects of various mathematical topics: finite precision, solutions of non-linear equations, interpolation, approximation, linear systems of equations, and integration. Cross listed as CS 510. Prerequisites: CS 104 or 106; MTH 207 and 223.

#### **MTH 511 Numerical Methods II** 3 hrs.

Continuation of CS/MTH 510: further techniques of integration, ordinary differential equations, numerical linear algebra, nonlinear systems of equations, boundary value problems, and optimization. Cross listed as CS 511. Prerequisites: MTH 224 or 345; CS/MTH 510.

#### **MTH 514 Partial Differential Equations** 3 hrs.

Fourier series and applications to solutions of partial differential equations. Separation of variables, eigenfunction expansions, Bessel functions, Green's functions, Fourier and Laplace transforms. Prerequisite: MTH 224 or 345.

#### **MTH 515 Finite Element Analysis** 3 hrs.

Mathematics of finite elements, variational and residual methods, error analysis, element analysis, ordinary and partial differential equations, various boundary conditions, and selected applications. Prerequisite: MTH 224 or 345.

#### **MTH 590 Special Topics** 3 hrs.

Topics of special interest which may vary each time course is offered. Topic stated in current Academic Handbook. Prerequisite: consent of instructor.

### Philosophy

#### **PHL 551, 552 Readings in Philosophy** 1-3 hrs. each

Directed individual study. Prerequisites: 6 hours in philosophy; senior or graduate standing; consent of department chair.

### Physics

#### **PHY 501 Quantum Mechanics I** 3 hrs.

Inadequacies of classical physics when applied to problems in atomic and nuclear physics. Development of mathematical formalism used in basic quantum

theory. Applications to simple models of physical systems. Prerequisites: PHY 202, 301, 306; consent of instructor. MTH 207 recommended.

**PHY 502 Quantum Mechanics II**  
**3 hrs.**

Mathematical formalism of quantum mechanics. Applications to problems of electron spin and many-particle systems. Development of approximation techniques with applications to complex physical systems. Prerequisite: PHY 501.

**PHY 510 Experimental Physics Topics**  
**3 hrs.**

Discussion of applications of physics principles; detailed evaluations of recent experimental physics. Emphasis on laboratory measurements, including laboratory practice at local and regional research sites. Prerequisites: any advanced undergraduate course with laboratory; consent of instructor.

**PHY 539 Topics in Theoretical Physics**  
**3 hrs.**

Topics of special interest which may vary each time course is offered. Topic stated in current Academic Handbook. Prerequisites: PHY 301, 305, 501; or consent of instructor.

**PHY 545 Biophysics**  
**3 hrs.**

Applications of physics principles and methods to investigation of biological systems. Emphasis on physical environmental effects on biological systems. Cross listed as BIO 545. Prerequisites: PHY 108 or 201; senior standing; or consent of instructor. PHY 345 recommended.

**PHY 555 Independent Readings**  
**1-3 hrs.**

Individual assignments of relevant topics in physics or astronomy. Prerequisites: senior or graduate student standing; background appropriate to the study; consent of instructor.

**PHY 561 Physical Electronics**  
**3 hrs.**

Electronic principles; applications to measurement devices utilized in science research. Paced self-instruction and laboratory work. Prerequisites: PHY 202; MTH 224.

**PHY 563 Special Problems in Physics**  
**1-3 hrs.**

Qualified students work on an individually assigned problem and prepare oral and written reports on the problem solution. Approved for off-campus programs when required. May be repeated for a maximum of 6 hours credit. Prerequisites: physics preparation sufficient for the problem; consent of instructor and Department Chair.

**PHY 567 Thermophysics and Statistical Mechanics**  
**3 hrs.**

Rigorous treatment of classical thermodynamics; applications of the first and second laws. Classical quantum statistics with applications to the ideal gas, electrons in metals, and other electronic and photon processes in matter. Prerequisites: PHY 202, 301; consent of instructor.

**PHY 568 Condensed Matter Physics**  
**3 hrs.**

Introduction to condensed matter physics for students of physics, materials science, and engineering. Structure of crystals; binding energy of solids; thermal properties; semiconductors; superconductivity. Prerequisites: MTH 224; consent of instructor. PHY 501 recommended.

**PHY 681 Readings in Physics**  
**1-6 hrs.**

Directed reading for qualified students. Maximum of 3 hours per semester. Prerequisites: physics at the 500 level and consent of instructor.

**PHY 683 Research**  
**1-6 hrs.**

Basic experimental or theoretical research in physics or astronomy. Prerequisite: accepted graduate research proposal.

**PHY 699 Thesis**  
**1-6 hrs.**

Research and thesis preparation. Open to students in the MNS program only. Repeatable for up to 6 hours credit. A student can receive no more than a total of 6 hours credit in BIO 699 or CHM 699 or PHY 699. Prerequisite: consent of program coordinator.

## Political Science

**PLS 583, 584 Reading in Political Science**  
**1-3 hrs. each**

Individual in-depth work on a subject approved and supervised by a PLS faculty member. For highly qualified students. Prerequisites: senior standing; political science major; consent of instructor.

## Psychology

**PSY 532 Personality Theories and Theorists**  
**3 hrs.**

Comprehensive survey of views on structure and function of personality, contemporary research, and methods of assessment. Prerequisite: PSY 445 or consent of instructor.

**PSY 536 Statistical Methods for Research**  
**3 hrs.**

Advanced statistical techniques for psychological research, including univariate and multivariate procedures. Prerequisite: introductory statistics.

**PSY 537 Advanced Regression/Correlation Analysis**  
**3 hrs.**

Comprehensive treatment of regression/correlation procedures. Fundamentals, assumptions, model fitting, multicollinearity, outlier analysis, specification errors, and transformations. Prerequisites: PSY 205 or MTH 111 or QM 262 or equivalent.

**PSY 630 Practicum in Assessment and Therapeutic Intervention**  
**3 hrs.**

Development of treatment planning skills in applied settings. Consolidates and integrates the training initiated in assessment and therapeutic intervention courses. Prerequisites: PSY 633, 635.

**PSY 631, 632 Internship I, II****2 hrs. each**

Supervised internship experience. Prerequisite: candidacy in community-clinical degree program.

**PSY 633 Psychotherapy I: Psychotherapy Systems and Process****3 hrs.**

Introduction to theoretical and technical approaches to psychotherapy; process issues in the therapeutic relationship. Prerequisite: graduate standing in psychology or consent of instructor.

**PSY 634 Assessment I: Behavioral****3 hrs.**

Theory and methods of behavioral assessment; use of single case designs. Prerequisite: graduate standing in psychology or consent of instructor.

**PSY 635 Assessment II: Psychological****3 hrs.**

Methods of diagnostic interviewing; major objective psychological tests. Prerequisite: graduate standing in psychology or consent of instructor.

**PSY 636 Psychotherapy II: Cognitive and Behavioral Interventions****3 hrs.**

Cognitive interventions, behavior therapy, and behavior modification. Theoretical basis and clinical application of major treatment techniques. Prerequisite: PSY 633 or consent of instructor.

**PSY 681, 682 Readings I, II****1-3 hrs. each**

Readings in area selected by student. Prerequisites: graduate standing and prearrangement with instructor.

**PSY 691, 692 Research I, II****1-3 hrs. each**

Research in area selected by student. Prerequisites: graduate standing and prearrangement with instructor.

## Sociology

Undergraduate registration in any 500-numbered course requires the permission of the chair of the sociology department.

**SOC 571 Field Studies****1-3 hrs.**

Individual research. Prerequisite: senior or graduate standing and consent of department chair.