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 lifelong 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.

Interdisciplinary Courses

SCI 501  Topics in Investigative Science for Educators  3 hrs.
Laboratory-based biological and physical science. Content developed along interdisciplinary themes. Course taught in an inquiry/investigative format, and includes application to Pre K-12 classroom settings. Course may be repeated under different topic. NOTE: Credit will not be given for SCI 501 students who have obtained credit for SCI 101 under the same theme. Registration is not open to undergraduate or graduate students enrolled in a natural science degree program. Prerequisites: Concurrent enrollment in ETE 550.

Biology

Sherri Morris,
Graduate Program Coordinator

Minimum prerequisites for admission to the graduate program in biology are: 16 semester hours of biology beyond freshman biology, one semester of organic chemistry, one semester of physics, one semester of calculus, GPA above 3.0, and a sum of the GRE verbal and quantitative sections above 1000.

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 biology; the remaining hours may include cognate courses (e.g., in education, psychology, or computer science) approved by the graduate coordinator. Of the total 32 hours, sixteen hours must be classroom courses (i.e., non-independent study) and twelve hours must be taken at the 600 level. The graduate coordinator must approve the entire course of study.

The student must pass a comprehensive oral exam covering any aspect of biology, with an emphasis on the graduate classes taken by the student and the student’s field of study. The oral comprehensive exam must be passed during the semester immediately following completion of 24 graduate semester hours. Oral comprehensive exams will be offered during a one-week period in each of the spring and fall semesters.

All biology graduate students must complete an independent research thesis and enroll in six 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 coordinator. A majority of committee members must be from the faculty of the department of Biology at Bradley University. This committee will advise the student in his or her thesis research. Within three semesters following enrollment in the graduate program (or prior to completion of 18 semester hours), the student must submit a thesis proposal to his or her thesis committee. The student will be permitted to enroll in BIO 699 (thesis) only upon written acceptance of the proposal by the thesis committee. Upon completion of the thesis, a student will present a departmental seminar.
The student must then successfully defend the thesis to the committee members. Full-time students should anticipate requiring a minimum of four semesters for completion of the biology graduate program.

**Course Descriptions**

**BIO 501  Biology of Fishes  3 hrs.**
Fishes: organ-system structure and function, ecology, embryology, behavior, and economic importance. Prerequisites: 6 hours college-level biology.

**BIO 502  Biometry  3 hrs.**
Principles of biological measurement. Topics include the nature of data, sampling, experimental design, and statistical analysis. Prerequisites: C or better in BIO 223, or six hours of college biology.

**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 509  Human Genetics  3 hrs.**
Genetic theory and methodology applied to humans. Prerequisites: C or better in BIO 224.

**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: 6 hours college-level biology.

**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: 6 hours college-level biology.

**BIO 564  Advanced Molecular Biology  3 hrs.**
Selected topics in molecular biology. Emphasis on proteins and nucleic acids. Prerequisites: C or better in BIO 224.

**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: 6 hours college-level biology or zoology.

**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 568  Cellular and Molecular Immunology  3 hrs.**
Interaction between antigen presenting cells, B lymphocytes, and T lymphocytes to mount immune responses. Molecules responsible for immune interactions. Methods to study cell and molecular interactions in immunity. Prerequisites: BIO 564 or equivalent.

**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 grade point average in student's major; senior or graduate standing; consent of instructor.

**BIO 575  Special Graduate Topics in Biology  2-3 hrs.**
Selected graduate-level coursework in biology. May be repeated under different topics for a total of 6 credit hours. Prerequisites: 3.0 grade point average in graduate-level biology program; or consent of instructor.

**BIO 580  Readings  1-3 hrs.**
Individual assignments of relevant topics in biological sciences. Prerequisites: 3.0 grade point 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 grade point 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.
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 Schedule of Classes. Prerequisite: CHM 351, 461.

**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 556 Organic Spectroscopy** 3 hrs.
Characterization/identification of compounds using spectrometric methods. Not open to students with credit in CHM 356 or equivalent. Prerequisites: CHM 351 or equivalent.
CHM 568  Selected Topics in Biochemistry  1-3 hrs.
Content and credit will vary as indicated in current schedule of classes. May be repeated for up to eight credits, with no more than two credits counting towards the major. Prerequisite: CHM 366.

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 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 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 Program Coordinator

Jiang B. Liu, Young Park,
Graduate Advisors

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.

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.
coherent program in an applications area and must be approved by the graduate coordinator. Admission requirements and graduation requirements specific to computer science and computer information systems are given below. In addition, applicants must submit GRE General Test scores taken with the last five years. The applicant may request a GRE waiver under certain circumstances. 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.

**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 310 or equivalent.

**CIS 588**  
Introduction to Expert Systems and Artificial Intelligence 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 IME 568. 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. Prerequisite: a grade of C or better in CS 121 or equivalent.

**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: a grade of C or better in CS 121 or equivalent.
Computer Science

CS 500  JAVA Programming and Web Design  3 hrs.
Introduction to JAVA programming and PERL. Internet and Web-based applications, design and building of multimedia systems, user interface design, Gateway Interface (CGI) scripting; VRML. Prerequisite: CS 121 or equivalent.

CS 502  Advanced Programming  3 hrs.
Introduces the fundamental concepts of programming from an object-oriented perspective with emphasis on advanced programming skills and good software development principles in a closed laboratory setting. Covers topics including object-oriented paradigm, design and programming, fundamental data structures and computing algorithms, and software development principles. Prerequisites: consent of graduate program coordinator; at least two semesters of programming experience.

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: a grade of C or better in both MTH 120 and CS 121.

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. Prerequisites: CS 405 or equivalent.

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 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: a grade of C or better in CS 302; one semester of statistics.

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 518  Programming Language Translation  3 hrs.
Overview of programming language translation with emphasis on modern compiler construction. Lexical analysis, parsing, syntax and semantic analysis, code generation, garbage collection, and optimization. Prerequisite: grade of C or better in CS 302. Corequisite: CS 516 or CS 216.

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: a grade of C or better in CS 302.

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. Prerequisite: a grade of C or better in CS 302.

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: a grade of C or better in CS 302; one course in statistics.

CS 530  Client-Server Computing with JAVA  3 hrs.
Continuation of CS 500. JAVA programming in client-server environment. JAVA distributed computing and distributed object computing protocols. Internet and object Web computing in JAVA. JAVA Enterprise computing technologies. Prerequisite: CS 500 or equivalent.

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 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 re-
covery. Query optimization. Latest developments in databases. Prerequisite: a grade of C or better in CS 302 or CIS 607.

**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.

**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.

**CS 615 Software Engineering I** 3 hrs.
Software engineering: technical management; project management, estimation, and control; economics; environments; standards; products and their phases. Prerequisites: a grade of C or better in CS 302 or CS 310.

**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: a grade of C or better in CS 302 or CS 310.

**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: a grade of C or better in CS 302.

**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

Kevin Swafford,
Graduate Program 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 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 program enriches students' professional lives and enhances their 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 508 Composing Hypertext 3 hrs.
Elements of hypertext composition, mechanics, style, and theory. Prerequisite: graduate standing; or specially qualified junior or senior; or completion of C2 general education requirement; or consent of instructor.

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,
Coordinator/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**

Most MLS courses are offered only when there is a demonstrated demand and faculty members are available. Contact the coordinator/director for further information.

**MLS 601 Physical Science Concepts & 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  
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  
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  
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  
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  
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  
Idealogical 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  
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  
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  
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  
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  
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  
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  
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  The Places We Inhabit: Design of Cities and Towns  
An examination of the value and importance of the physical structure and physical characteristics of human settlements. Treating them metaphorically as living organisms, like any other, which need careful, thoughtful creation and maintenance. Includes some history of the evolution of human settlements and considers examples of utopian and purpose-built cities and towns, taken from America and elsewhere. The art and science of physical space (architecture), at both the micro and macro scale, figure prominently in class discussions and exercises. Prerequisite: enrollment in the M.L.S. program.

MLS 623  Death and Dying: An Interdisciplinary Inquiry  
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 and 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 632 The Pacific Century: US Asian/Pacific Relations Since 1900 3 hrs.
Examines America's role and influence in the rise of Japanese and Chinese power and the meaning and significance of the Korean and Vietnam wars.

MLS 633 Issues in Higher Education 3 hrs.
Covers both controversial and topical issues in higher education. Examination of the myriad of issues (sometimes changing daily) that occur in higher education, the challenges and opportunities facing higher education, and the nature and complexity of universities and higher education.

MLS 634 Understanding Cancer 3 hrs.
Cancer is one of the most prevalent and publicized diseases in most of the world, yet the general nature of the disease is not well understood by most of the population. Discussion of a myriad of issues related to the disease of cancer from a definition of the disease to the types, treatments, and causes. Opportunity to discuss the disease with a medical oncologist, radiation oncologist, and cancer geneticist. Students who successfully complete the course will have general knowledge and understanding of the many aspects of cancer. They will also be able to intelligently discuss cancer issues and be able to answer general questions about the disease.

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 coordinator and the chair of the department concerned.

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 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.

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, with applications to simple models of physical systems. Prerequisites: PHY 301; PHY 202, 303, 306 or consent of instructor. MTH 207 recommended.

PHY 502 Quantum Mechanics II 3 hrs.
The mathematical formalism of quantum mechanics with applications to problems of electron spin and many-particle systems will be studied along with development of approximation techniques with applications to complex physical systems. Prerequisite: PHY 501.

PHY 539 Topics in Theoretical Physics 3 hrs.
Topics of special interest which may vary each time course is offered. Topic stated in current Schedule of Classes. Prerequisites: PHY 301, 305, 501; consent of instructor.

PHY 541 Physics Basics 2 hrs.
Numerical and graphical analysis of data; basic mechanics including Newton’s laws and gas laws; hydrostatics and hydrodynamics; energy conservation principles; thermal physics; electricity and magnetism; and solubility and transport processes. Only students in the Nurse Administered Anesthesia Program may register.

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

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 568  Condensed Matter Physics  3 hrs.
Introduction to the physics of the solid state and other con-
densed matter especially for students of physics, materials
science, and engineering: structure of crystals; molecular
binding in solids, thermal properties, introduction to energy
band structure and its relation to charge transport in solids;
semiconductors; superconductivity. Prerequisite: Physics
majors: PHY 301, 202, or 303; PHY 305. Corequisite: PHY 306.
Other majors need instructor consent.

Political Science

PLS 583, 584  Reading in Political
Science  1-3 hrs. each
Individual in-depth work on a subject approved and su-
pervised by a PLS faculty member. For highly qualified
students. Prerequisites: senior standing; political science
major; consent of instructor.

Sociology

SOC 571  Field Studies  1-3 hrs.
Individual research. Prerequisite: senior or graduate stand-
ing and consent of department chair.