

Second Year		A S
CHMY 221-223 (CHEM 221-222) Organic Chemistry		3 3
CHMY 222 (CHEM 223) Organic Chemistry I Laboratory		2 -
CHMY 225 (CHEM 264) (or 224) Organic Chemistry Laboratory		- 3
M 273 (MATH 251) Calculus III		4 -
PHSX 215N-216N and 217N-218N (PHYS 211N-213N or 212N-214N) Fundamentals of Physics I and II with Calculus (preferred) or PHSX 205N-206N and 207N-208N (PHYS 111N-113N and 112N-114N) Fundamentals of Physics I, II		5 5
General Education or electives		- 6
		14 17
Third Year		A S
CHMY 302E (CHEM 334) Chem Literature & Scientific Writing		3 -
CHMY 311 (CHEM 341) Analytical Chem-Quant Analysis		4 -
CHMY 421 (CHEM 342) Advanced Instrument Analysis		- 4
CHMY 373-371 (CHEM 371-372) Phys Chem-Kntcs & Thrmdynmcs & Phys Chem-Qntm Chm & Spctrscopy		4 4
Advanced electives		3 3
General Education		3 6
		17 17
Fourth Year		A S
Advanced CHEM elective		3 3
General Education or elective		3 -
Modern Foreign Language		5 5
Upper-division elective		6 6
		17 14

Requirements for a Minor To earn a minor in chemistry the student must complete CHMY 141N, 143N, 221, 222, 223, 311, 360 or 373 (CHEM 161N, 162N, 221, 222, 223, 341, 370 or 371) and at least two courses from one of the following groups:

- (a) CHMY 422, 371, 442, 445, 401, 403, 465 (CHEM 342, 372, 442, 445, 452, 453, 465)
- (b) If the student's major does not require biochemistry, BCH 380 or 480 and 482 (BIOC 380 or 481 and 482)

For teaching minor requirements, see the Teacher Preparation in Chemistry section above.

Courses

U = for undergraduate credit only, UG = for undergraduate or graduate credit, G = for graduate credit. R after the credit indicates the course may be repeated for credit to the maximum indicated after the R. Credits beyond this maximum do not count toward a degree.

Chemistry (CHMY)

U 101N (CHEM 101N) Chemistry for the Consumer 3 cr. Offered summer. An introduction to chemistry that emphasizes the influence of chemistry on one's everyday life. Common household products, such as soap, aspirin, toothpaste, face cream and fertilizers are prepared in the lab.

U 104 (CHEM 104) Preparation for Chemistry 3 cr. Offered autumn. An introduction to chemistry for those who believe they have an inadequate background to enroll in CHMY 121N or 141N (CHEM 151N or 161N). Not appropriate toward chemistry requirement in any major.

U 121N (CHEM 151N) Intro to General Chemistry 3 cr. Offered autumn and spring. First semester of an introduction to general, inorganic, organic and biological chemistry.

U 122 (CHEM 153) Intro to General Chemistry Laboratory 1 cr. Offered autumn and spring. Prereq., Enrolled in the College of Technology ASRN program. Prereq. or coreq., CHMY 121N (CHEM 151N) or equivalent. A laboratory course emphasizing inorganic chemistry, quantitative relations and synthesis of inorganic and organic compounds.

U 123N (CHEM 152N) Intro Organic and Biological Chemistry 3 cr. Offered autumn and spring. Prereq., "C-" or equiv. in CHMY 121N (CHEM 151N) or consent of instr. Second semester of an introduction to general, inorganic, organic and biological chemistry.

U 124N (CHEM 154N) Intro Organic and Biological Chemistry Laboratory 2 cr. Offered autumn and spring. Prereq. or coreq., CHMY 123N (CHEM 152N). Laboratory to accompany CHMY 123N (CHEM 152N).

U 141N (CHEM 161N) College Chemistry I 5 cr. Offered autumn and spring. Prereq., high school algebra; [CHMY Placement Test Score \$\geq\$ 13](#). For science majors and other students intending to take more than one year of chemistry. Properties of elements, inorganic compounds, liquid solutions, chemical equilibria and chemical kinetics. Includes laboratory.

U 143N (CHEM 162N) College Chemistry II 5 cr. Offered spring and summer. Prereq., "C-" or better in CHMY 141N (CHEM 161N) or consent of instr. A continuation of CHMY 141N. Includes Laboratory.

U 191 (CHEM 195) Special Topics Variable cr. (R-6) Offered intermittently. Experimental offerings of visiting professors, experimental offerings of new courses, or one-time offerings of current topics.

U 221 (CHEM 221) Organic Chemistry I 3 cr. Offered autumn. Prereq., CHMY 123N or 143N (CHEM 152N or 162N). The chemical and physical properties of organic compounds.

U 222 (CHEM 222) Organic Chemistry I Laboratory 2 cr. Offered autumn. Coreq., CHMY 221 (CHEM 221); prereq., one semester of 100-level laboratory. Microscale techniques are emphasized.

U 223 (CHEM 223) Organic Chemistry II 3 cr. Offered spring. Prereq., CHMY 221 (CHEM 221). Continuation of 221.

U 224 (CHEM 224) Organic Chemistry II Laboratory 2 cr. Offered spring. Prereq., CHMY 222 (CHEM 223); prereq. or coreq., CHMY 223 (CHEM 222)

U 225 (CHEM 264) Organic Chemistry Laboratory for Chemistry Majors 3 cr. Offered spring. Prereq., CHMY 223 (CHEM 223); coreq., CHMY 222 (CHEM 222). Second semester of organic chemistry laboratory for chemistry majors only. Incorporates larger-scale techniques and instrumental organic analysis.

U 291 (CHEM 295) Special Topics 1-6 cr. (R-6) Offered intermittently. Experimental offerings of visiting professors, experimental offerings of new courses, or one-time offerings of current topics.

U 292 (CHEM 297) Independent Study cr. (R-10) Offered autumn and spring. Prereq., one semester of chemistry and consent of instr. Laboratory investigations and research in the laboratory of a faculty member.

U 302E (CHEM 334) Chemistry Literature and Scientific Writing 3 cr. Offered autumn and spring. Prereq., CHMY 223 (CHEM 222) and chemistry major. Presentation and discussion of current literature in chemistry. Use of library and search tools. Workshop for developing and improving skills in scientific writing and evaluation. Use of on-line data bases and the interface of these with PC-based word processing and scientific graphics programs.

U 311 (CHEM 341) Analytical Chem-Quant Analysis 4 cr. Offered autumn. Prereq., one year of college chemistry, including laboratory. Classroom and laboratory work in gravimetric, volumetric, colorimetric and electrochemical methods of analysis; theory of errors; ionic equilibria in aqueous solutions.

U 360 (CHEM 370) Applied Physical Chemistry 3 cr. Offered spring. Prereq., CHMY 123 OR 143 AND M 162 (CHEM 152 or 162 and MATH 150). Basic thermodynamics and chemical kinetics with applications in the biological and environmental sciences. Credit not allowed for both 360 and 373 (CHEM 370 and 371).

U 371 (CHEM 372) Physical Chemistry Qntm Chm & Spctrscty 4 cr. Offered spring. Prereq., CHMY 373 (CHEM 371). Systematic treatment of the laws and theories relating to chemical phenomena.

U 373 (CHEM 371) Physical Chemistry Kntcs & Thrmdynmcs 4 cr. Offered autumn. Prereq., CHMY 143 (CHEM 162), M 273 (MATH 251), PHYS 122 or 222. Systematic treatment of the laws and theories relating to chemical phenomena. Credit not allowed for both CHMY 360 and 373 (CHEM 370 and 371).

U 391 (CHEM 395) Special Topics Variable cr. (R-9) Offered intermittently. Experimental offerings of visiting professors, experimental offerings of new courses, or one-time offerings of current topics.

U 397 (CHEM 380) Teaching Chemistry 1 cr. Offered every term. Prereq., CHMY 141N-143N (CHEM 161N-162N) with B or better and consent of instr. Methods of peer-led team learning as applied to general chemistry instruction. Review of

concepts from general chemistry. Student leaders mentor a team of general chemistry students in working toward constructing chemistry knowledge and developing problem-solving skills.

U 398 (CHEM 398) Internship Variable cr. Offered autumn and spring. Prereq., consent of department. Extended classroom experience which provides practical application of classroom learning during placements off campus. Prior approval must be obtained from the faculty supervisor and the Internship Services office. A maximum of 6 credits of Internship (198, 298, 398, 498) may count toward graduation.

UG 401 (CHEM 452) Advanced Inorganic Chemistry 3 cr. Offered autumn. Prereq., CHMY 223 AND 360 OR 373 (CHEM 222 and 370 or 371) or consent of instr. Theory and principles of inorganic chemistry and a systematic coverage of descriptive inorganic chemistry in the context of the periodic table.

UG 402 (CHEM 455) Advanced Inorganic Chemistry Laboratory 2 cr. Offered spring. Prereq., CHMY 224 AND 360 or 373 (CHEM 224 and 370 or 371) and consent of instr. Preparation of inorganic and coordination compounds. Isolation and characterization by ion exchange, column chromatography, IR, UV-VIS, derivatives, MP, and BP.

U 403 (CHEM 453) Descriptive Inorganic Chemistry 3 cr. Offered spring. Prereq., CHMY 221-222, 360 or 373-371, and 401 (CHEM 221-223, 370 or 371-372 and 452). A survey of the chemistry of the elements including transition metal reaction mechanisms, redox chemistry, organometallic chemistry, bioinorganic chemistry.

UG 421 (CHEM 342) Advanced Instrumental Analysis 4 cr. Offered spring. Prereq., CHMY 311 (CHEM 341). Theory and use of instrumental methods in the study of analytical and physical chemistry.

UG 442 (CHEM 442) Aquatic Chemistry 3 cr. Offered autumn odd-numbered years. Prereq., CHMY 311 (CHEM 341) or consent of instr. Application of chemical equilibria theory for understanding and modeling chemical processes in natural waters with an emphasis on spreadsheet computations. In depth examination of concepts such as pH, alkalinity, buffering, and solubility as they apply to natural waters.

UG 445 (CHEM 445) Industrial Chemistry and Its Impact on Society 3 cr. Offered every other autumn semester. Prereq., CHMY 143 or 123 (CHEM 162 or 152). A course based on local Montana chemical industries involving field trips to chemical plants, visits by company personnel and an overall evaluation of the company's economic and environmental impact on the community.

UG 465 (CHEM 465) Organic Spectroscopy 3 cr. Offered intermittently. Prereq., CHMY 360 or 373 (CHEM 370 or 371) and one year of organic chemistry or consent of instr. Theory and interpretation of the NMR, IR, UV, and mass spectra of organic compounds with the goal of structure identification.

U 466 (CHEM 466) FT-NMR Operation for Undergraduate Research 1 cr. Offered intermittently. Prereq., CHMY 221-222 (CHEM 221-223); research project using NMR; consent of instr. Operation of the FT-NMR spectrometer and brief background of NMR spectroscopy.

U 480 (CHEM 441) Techniques of Glass Manipulation 1 cr. Offered intermittently. Fabrication and repair of laboratory glassware. Basic operations include cutting glass, bending, end seals, joining (same and different diameters), T-seals, bulbs, ring or inner seals, condensers.

UG 485 (CHEM 485) Laboratory Safety 1 cr. Offered autumn. Prereq., one year of college chemistry. Awareness of and methods of control of hazards encountered in laboratory work. Awareness of legal constraints on work with chemicals. Sources of information regarding chemical hazards.

U 488 (CHEM 488) Forensic Research 3 cr. Offered autumn, spring and summer. Prereq., consent of instr. Laboratory investigations and research on forensic chemistry topics under the direction of a faculty member.

U 489 (CHEM 489) Forensic Research Seminar 1 cr. Offered autumn. Prereq., CHMY 421 (CHEM 342) and ANTH 286N. Seminar speakers on forensic science topics in the areas of ethics, law, anthropology and criminology; tours of the Montana State Crime Laboratory.

U 490 (CHEM 497) Undergraduate Research 1-9 cr. Undergraduate Research Variable cr (R-9). Offered autumn, spring, and summer. Prereq., consent of instr. Laboratory investigations and research in the laboratory of a faculty member.

UG 491 (CHEM 495) Special Topics Variable cr. (R-9) Offered intermittently. Experimental offerings of visiting professors, experimental offerings of new courses or one-time offerings of current topics.

UG 492 Independent Study cr. (R-9) Offered autumn and spring. Prereq., consent of instr. Laboratory investigations and research in the laboratory of a faculty member.

UG 494 (CHEM 494/497) 1-9 cr. (R-9) Offered autumn and spring. Prereq., consent of instr. Laboratory investigations and research in the laboratory of a faculty member.

U 498 (CHEM 498) Internship 1-6 cr. Prereq., consent of department. Extended non-classroom experience which provides practical application of classroom learning during placements off campus. Prior approval must be obtained from the faculty supervisor and the Internship Services office. A maximum of 6 credits of Internship (198, 298, 398, 498) may count toward graduation.

U 499 (CHEM 499) Senior Thesis 3 cr. Offered autumn and spring. Prereq., CHMY 490 or consent of instr. and senior standing. Students complete and report on undergraduate research initiated as CHEM 490 or equivalent research experience. Reports are both oral and written.

G 501 (CHEM 501) Teaching University Chemistry 1 cr. Offered autumn. Preparation for teaching chemistry at the college level. A survey of teaching fundamentals and educational psychology as applied to chemistry instruction.

G 541 (CHEM 541) Environmental Chemistry 3 cr. Offered intermittently. Prereq., CHMY 360 OR 373 (CHEM 370 or 371). Chemical principles and reactions in natural systems: Fate of chemical contaminants in the environment; partitioning of contaminants between phases (air/water/soil); chemistry of atmospheric pollutants; computer modeling of equilibrium and kinetic processes; degradation and transformation of organic contaminants.

G 542 (CHEM 542) Separation Science 3 cr. Offered autumn odd-numbered years. Prereq., CHMY 421 (CHEM 342), CHMY 360 (CHEM 370) or 373 (CHEM 371). Theory, method development, and application of analytical separations; solvent extraction; solid phase extraction; various forms of chromatography; electrophoresis.

G 544 (CHEM 544) Applied Spectroscopy 3 cr. Offered intermittently. Prereq., CHMY 421 (CHEM 342) or consent of instr. The function and application of optical (ultraviolet to infrared) chemical instrumentation. Specific topics include optics, light sources, detectors and a wide variety of spectrochemical methods with an emphasis on methods not typically covered in undergraduate instrumental analysis courses.

G 553 (CHEM 553) Inorganic Chemistry and Current Literature 4 cr. Offered spring. Prereq., CHMY 401 (CHEM 452). A survey of the elements including transition metal reaction mechanisms, redox chemistry, organometallic chemistry, bioinorganic chemistry. Oral and written presentations on primary literature.

G 561 (CHEM 561) Bioorganic Chemistry of Antibiotic and Natural Product Biosynthesis 3 cr. Offered intermittently. Prereq., one year of organic chemistry; preferred prereq. or coreq., biochemistry. Comprehensive study of the bioorganic chemistry of antibiotic and natural product production in bacteria, plants, and higher animals, focusing on polyketide, shikimate, alkaloid, terpene, and nitrogen-containing/non-alkaloid compounds. Natural product diversity, drug screening and dereplication, combinatorial biochemistry, and pathway manipulation to produce "non-natural" natural products.

G 562 (CHEM 562) Organic Structure and Mechanism 3 cr. Offered intermittently. Prereq., one year of organic chemistry. Topics may include: stereochemistry, conformational analysis, aromaticity, transition state theory, isotope effects, solvent effects, substitution and elimination reactions, and mechanisms that involve carbocations, carbanions, radicals and carbenes as reactive intermediates.

G 563 (CHEM 563) Organic Synthesis 3 cr. Offered intermittently. Prereq., CHMY 221-223 (CHEM 221, 222). Theoretical treatise of the common methods used in organic synthesis including: oxidation, reduction, organometallics, C-C bond forming

reactions, synthetic strategies and total synthesis.

G 564 (CHEM 564) Organic Reactions 3 cr. Offered intermittently. Prereq., one year of organic chemistry. Reactions such as alkylation of nucleophilic carbons, reactions of carbon nucleophiles with carbonyl groups, functional group interconversions by nucleophilic substitution reactions, electrophilic additions to carbon-carbon multiple bonds, and select oxidations/reductions.

G 566 (CHEM 566) FT-NMR Operation for Graduate Researchers 1 cr. Offered intermittently. Prereq., CHMY 221-222 (CHEM 221-223); research project using NMR; consent of instr. Operation of the FT-NMR spectrometer and brief background of NMR spectroscopy.

G 568 (CHEM 568) Organometallic Chemistry 3 cr. Offered intermittently in autumn. Prereq., CHMY 221, 223, 401, 403 (CHEM 221, 222, 452, 453). Survey of the reactivity and structure of main group and transition metal organometallic compounds with an emphasis on applications to organic synthesis and catalysis.

G 569 (CHEM 569) Medicinal Chemistry 3 cr. Offered intermittently. Prereq., CHMY 221, 223 (CHEM 221, 222); BIOC 380 or equiv. Same as BMED 621. Introduction to the historical and contemporary discoveries in medicinal chemistry.

G 573 (CHEM 573) Advanced Physical Chemistry 3 cr. Offered intermittently. Prereq., CHMY 371-373 (CHEM 371-372). Fundamental principles of physical chemistry and special applications.

G 580 (CHEM 580) Advanced Graduate Student Research Seminars 1 cr. (R-10) Offered every term. Prereq., consent of instr. Formal oral and written presentations of research results and selected literature topics in a designated area.

G 581 (CHEM 581) Chemical Biology 3 cr. Offered intermittently. Prereq., consent of instr. Synthesis and structure of native and modified biomolecules such as antisense phosphothioate oligonucleotides, modified nucleosides and nucleotides designed for antiviral activity, and PNAs (peptide nucleic acids). Emphasis on the interaction of biomolecules and "small" organic and inorganic molecules and their chemical impact on native structure and function.

G 593 (CHEM 593) Professional Project 3 cr. Offered autumn and spring. Prereq., consent of instr.

G 595 (CHEM 595) Special Topics Variable cr. (R-9) Offered intermittently. Prereq., consent of instr. Experimental offerings of visiting professors, experimental offerings of new courses, or one-time offerings of current topics.

G 596 (CHEM 596) Independent Study Variable cr. (R-9) Offered autumn and spring. Prereq., consent of instr.

G 597 (CHEM 597) Research Variable cr. (R-open) Offered autumn and spring. Prereq., consent of instr.

G 598 (CHEM 598) Cooperative Education Experience Variable cr. (R-8) Offered autumn and spring. Prereq., consent of department. Extended non-classroom experience which provides practical application of classroom learning during placements off campus. Prior approval must be obtained from the faculty supervisor and the Internship Services office.

G 599 (CHEM 599) Thesis Variable cr. (R-6) Offered autumn and spring. Prereq., consent of instr.

G 630 (CHEM 630) Seminar 1 cr. (R-open) Offered autumn and spring. Prereq., graduate standing in chemistry or biochemistry, or consent of instr.

G 640 (CHEM 640) Introductory Graduate Seminar 1 cr. (R-open) Offered autumn. Prereq., graduate standing in chemistry or biochemistry or consent of instr. Seminar to acquaint new graduate students with departmental research.

G 650 (CHEM 650) Graduate Chemistry Seminar 1 cr. (R-open) Offered spring. Prereq., graduate standing.

G 697 (CHEM 697) Research Variable cr. (R-open) Offered autumn and spring. Prereq., consent of instr.

G 699 (CHEM 699) Dissertation Variable cr. (R-10) Offered autumn and spring.

Faculty

Professors

Bruce E. Bowler, Ph.D., Massachusetts Institute of Technology, 1986

Mark S. Cracolice, Ph.D., University of Oklahoma, 1994 (Chair)

Michael D. DeGrandpre, Ph.D., University of Washington, 1990

Christopher P. Palmer, Ph.D., University of Arizona, 1991

Nigel D. Priestley, Ph.D., Southampton University, 1991

Edward Rosenberg, Ph.D., Cornell University, 1970

J.B.A. (Sandy) Ross, Ph.D., University of Washington, 1976

Garon C. Smith, Ph.D., Colorado School of Mines, 1983

Kent Sugden, Ph.D., Montana State University, 1992

Associate Professors

Trina J. Valencich, Ph.D., University of California, Irvine, 1974 (Adjunct)

Assistant Professors

David Bolstad, Ph.D., The University of Montana, 2006

Klara Briknarova, Ph.D., Carnegie Mellon University, 1999

Xi Chu, Ph.D., University of Kansas, 2001

Valeriy Smirnov, Ph.D., University of Nebraska, 2004

Lecturer

Holly A. Thompson, Ph.D., Kansas State University, 1982

Research Professor

Robert Yokelson, Ph.D., Yale University, 1991

Research Associate Professors

William R. Laws, Ph.D., The Johns Hopkins University, 1977

Brooke D. Martin, Ph.D., Dartmouth College, 1998

Research Assistant Professor

Earle R. Adams, Ph.D., Montana State University, 1994

Emeritus Professors

James W. Cox, Ph.D., Montana State University, 1969

Ralph J. Fessenden, Ph.D., University of California, 1958

Richard J. Field, Ph.D., University of Rhode Island, 1968

Donald E. Kiely, Ph.D., University of Connecticut, 1965

R. Keith Osterheld, Ph.D., University of Illinois, 1950

Geoffrey N. Richards, Ph.D., D.Sc., University of Birmingham, 1964

Wayne P. Van Meter, Ph.D., University of Washington, 1959

Edward E. Waali, Ph.D., University of Wyoming, 1970

George W. Woodbury, Jr., Ph.D., University of Minnesota, 1964

Department of Communication Studies

- Special Degree Requirements
- Suggested Course of Study
- Courses
- Faculty

Steve Schwarze, Chair

Communication Studies engages in both social-scientific and humanistic approaches to the analysis, understanding and improvement of human communication. The discipline traces its roots to ancient Greek and Roman studies of the functions of public discourse in society, but in the twentieth century communication came to embrace the studies of interpersonal and small group interaction, human relations in organizations, media and society, and intercultural interaction. Although interdisciplinary in spirit, the discipline has a core of knowledge, theory, and concepts concentrating on such things as symbols, messages, interactions, networks, audiences, and persuasive campaigns. Uniting the field is the belief that the role of communication in human experience is basic to comprehending complex situations and problems in the modern world. The discipline has roles in both the broad traditions of liberal arts education and in the development and refinement of practical skills.

The Department of Communication Studies at The University of Montana-Missoula focuses on three broad areas of study: interpersonal interaction and human relationships, organizational communication, and rhetoric and public discourse. The knowledge and skills the student may acquire in each of these areas are important to functioning effectively in one's personal life, at work, and as a citizen of the larger society in a rapidly changing world.

The program in Communication Studies helps to prepare students for such diverse professions as: public relations officer, marketing analyst, human resources or personnel manager, community mediator, political speech writer, health communication trainer, social services director, or student services coordinator. Also, undergraduate and graduate study can assist the student in pursuing advanced studies for law, the ministry, and higher education.

Special Degree Requirements

Admission Requirements

To be admitted to the Communication Studies major, a student must complete COMM 111A and two other lower-division COMM courses.

Students who intend to major in communication studies but who have not yet met the above requirements are admitted to the program as Pre-Communication (PCOM) majors. (PCOM) majors may enroll in 100- and 200-level COMM courses only. Students must be fully admitted as Communication Studies (COMM) majors to enroll in 300- and 400-level courses.

Core Requirements

To graduate with a degree in Communication Studies, the student must complete 36 COMM credits with 18 of those credits in courses numbered 300 or above. A maximum of 6 credits in COMM 360 and a maximum of 6 credits in COMM 398 may count toward a major in communication studies. The following courses are required:

- A course in statistics (does not count toward 36 credits in Communication)
- COMM 110S Introduction to Interpersonal Communication
- COMM 111A Introduction to Public Speaking
- COMM 230S Introduction to Organizational Communication
- COMM 250H Introduction to Rhetorical Theory

COMM 460 Research Methods

To meet the Upper-division Writing Expectation for the major in Communication Studies, students must successfully complete one of the following courses: COMM 377, COMM 410, COMM 413, COMM 421, COMM 422, COMM 424, COMM 455, COMM 480, COMM 481 or another course approved for this purpose by the University curriculum committee.

Options and Allied Fields

COMM majors are advised to take courses in other allied disciplines throughout the University that will provide an increased understanding of communication, such as anthropology, business, English, environmental studies, linguistics, management, marketing, political science, psychology, social work, and sociology and women's and gender studies.

Students also are encouraged to consider a second major and/or minor in fields that complement their communication degree.

For instance, students interested in helping professions and associated content areas (e.g., children, families, aging) may choose the human and family development minor or the minor in gerontology. Student interested in new communication technology and its use within organizations should consider the media arts minor, while students interested in non-profit organizations should consider the minor in non-profit administration. Students in the rhetoric and public discourse should consider the minor in women's and gender studies or climate change.

Students can integrate courses in other fields into the COMM major by pursuing one or more of the options listed below.

Communication and Human Relationships Option

Students who elect to concentrate in communication and human relationships must complete:

All the core requirements listed previously.

At least five courses from the following: COMM 202S (Nonverbal Communication), 311 (Family Communication), 380 (Gender and Communication), 410 (Communication in Personal Relationships), 412 (Communication and Conflict), 413 (Communication and Conflict-Writing) and 451S (Intercultural Communication).

At least four courses from the following list: ANTY 227, 427 (ANTH 227, 427); COUN 485; EDEC 310 (C&I 355); HFD 412; NAS 342; PSYX 230S, 233, 345, 339, 360S, 385S, 348 (PSYC 240, 245, 336, 340, 350S, 351S, 385); SOCI 220S, 275S, 330, 332, 350 or 382 (SOC 220, 275S, 300, 330S, 340, or 350); SW 300, 420, 460.

Students may petition to count appropriate special topics or transfer courses upon recommendation of the student's advisor. All courses should be selected in consultation with a faculty advisor. Students electing this option are encouraged to minor in Human and Family Development.

Organizational Communication Option

Students who elect to concentrate in organizational communication must complete:

All the core requirements listed previously.

At least five courses from the following: COMM 240 (Communication in Small Groups), COMM 321 (Principles of Public Relations), COMM 322 (Public Relations Writing), COMM 412 (Communication and Conflict), COMM 421 (Communication in Nonprofit Organizations), COMM 422 (Communication and Technology in Organizations), COMM 423 (Practical Issues in Organizational Communication), COMM 424 (Risk, Crisis and Communication), COMM 425 (Communication in Health Organizations), and COMM 451S (Intercultural Communication).

At least three courses from the following list: ANTY 220S (ANTH 220S), BGEN 320E (MGMT 320E), BGEN 360 (MGMT 368), BMGT 340S (MGMT 340S), BMGT 357 (MGMT 457), BMGT 480 (MGMT 480), MGMT 344; BMKT 325 (MKTG 360), BMKT 343 (MKTG 363), BMKT 412 (MKTG 412); PSCI 361, 462, 466, 467 (PSC 361, 460, 466 and 467); SOCI 306, 345, 371 (SOC 306S, 320, 370S).

Students may petition to count appropriate special topics or transfer courses upon recommendation of the student's advisor.

All courses should be selected in consultation with a department faculty advisor.

Rhetoric and Public Discourse Option

Students who elect to concentrate in rhetoric and public discourse must complete:

All the core requirements listed previously.

At least four courses from the following: COMM 241 (Persuasive Communication), 242 (Argumentation), 350 (Persuasive Speaking and Criticism), 377 (Rhetoric, Nature and Environmentalism), 379 (Consumption, Media, and the Environment), 380 (Gender and Communication), 455 (Rhetorical Criticism and Theory), 480 (The Rhetorical Construction of "Woman"), and 481 (The Rhetoric of U.S. Women's Activism).

At least four courses from the following: ANTY 122S (ANTH 102); CCS 203; ECNS 433, 445 (ECON 440, 445); ENST 320, 367, 421 (EVST 167H, 367, 420); HSTA 102H, 262, 321, 322, 344, 387, 388, or 478; HSTR 272E, 302, 364, 384E (HIST 152H, 262, 357, 358, 362, 370H, 371H 226E, 301H, 364, 335E); MAR 101L; PHL 235 (PHIL 211), PHL 427E (EVST 427); PSCI 250E, 342, 343, 352, 355, 444, 471 or 474 (PSC 150E, 342, 343, 352, 355, 444, 471 or 472); SOCI 220S, 225, 325, 350, 470, 485 (SOC 220, 225, 325, 340, 470 or 485).

Students may petition to count appropriate special topics or transfer courses upon recommendation of the student's advisor. All courses should be selected in consultation with a faculty advisor.

Suggested Course of Study

	First Year	A	S
COMM 110S Introduction to Interpersonal Communication	-	-	3
COMM 111A Introduction to Public Speaking	3	-	-
COMM elective	-	-	3
WRIT 101 (ENEX 101) Composition	3	-	-
M 116 (MATH 117) Probability and Linear Mathematics	3	-	-
General Education	6	9	
	15	15	
	Second Year	A	S
COMM electives	-	-	6
COMM 230 Organizational Communication	3	-	-
COMM 250H Introduction to Rhetorical Theory	3	-	-
STAT 216 (MATH 241) or PSYC 222 (PSYC 220) or SOCI 202 (SOC 202) or HHP 486	3-4	-	-
General Education	3	3	
Electives	3	6	
	15-16	15	
	Third Year	A	S
COMM Writing course	3	-	-
COMM 460 Communication Research Methods	-	-	3
Upper-division COMM electives	3	3	
Upper-division electives	-	-	9
Electives	9	-	-
	15	15	
	Fourth Year	A	S
Upper-division COMM electives	3	3	
Upper-division electives	9	-	-
Electives	3	12	
	15	15	

Requirements for a Minor

To be admitted to the communication studies minor, a student must complete COMM 111A and two other lower-division COMM courses.

Students who intend to minor in communication studies but who have not yet met the above requirements are admitted as Pre-communication (PCOM) minors. Pre-communication minors may enroll in 100- and 200-level courses only. Students must be fully admitted as communication studies minors to enroll in 300- and 400-level courses.

Once admitted to earn a minor, the student must complete a minimum of 20 credits in COMM courses, with at least 9 credits

in courses numbered 300 and above. A maximum of 6 credits in COMM 360 may count toward a minor in communication studies.

Courses

U = for undergraduate credit only, UG = for undergraduate or graduate credit, G =for graduate credit. R after the credit indicates the course may be repeated for credit to the maximum indicated after the R. Credits beyond this maximum do not count toward a degree.

Communication Studies (COMM)

U 110S Introduction to Interpersonal Communication 3 cr. Offered yearly. An overview of the process of human communication with special emphasis on analyzing communication patterns and improving interpersonal communication skills. Credit not allowed for both COMM 110S and COM 150S.

U 111A Introduction to Public Speaking 3 cr. Offered every term. Preparation, presentation, and criticism of speeches. Emphasis on the development of public speaking techniques through constructive criticism. Credit not allowed for both COMM 111A and COM 160A.

U 173 Language Culture and Society 3 cr. Offered yearly. Same as LING 173. A survey of the elements of language (structure, meaning, and sound) including language use in its social and cultural contexts.

U 195 Special Topics Variable cr. (R-9) Offered intermittently. Experimental offerings of visiting professors, experimental offerings of new courses, or one-time offerings of current topics.

U 202S Nonverbal Communication 3 cr. Offered yearly. Nonverbal code systems and how they function in human communication including gestures, facial expressions, personal space, and others.

U 220 Professional Communication 3 cr. Offered intermittently.

U 230S Organizational Communication 3 cr. Offered yearly. Theory and research on communication in organizations. Focus on topics such as productivity, power, culture, socialization, technology and globalization covering a wide range of organizations including corporations, government, educational institutions, non-profit agencies and media organizations.

U 240 Communication in Small Groups 3 cr. Offered autumn and spring. Theory and research related to communication roles, collaboration, cohesion, leadership, and decision-making. Experiences provided in task oriented groups and field analyses of group processes.

U 241 Persuasive Communication 3 cr. Offered yearly. The use of communication in attitude and behavior change as experienced in personal, organizational, and public contexts.

U 242 Argumentation 3 cr. Offered autumn and spring. Prereq., sophomore standing. Development of argumentation skills and critical judgment in decision-making and debate. Includes criticism, construction, presentation, and refutation of spoken and written arguments.

U 250H Introduction to Rhetorical Theory 3 cr. Offered yearly. Prereq., COMM 111A. An overview of rhetorical theory including an exploration of classical rhetoric, British and Continental rhetorical theory, and contemporary theories of language and persuasion.

U 251X International and Development Communication 3 cr. Offered yearly. International Communication is concerned with information exchange across national borders while Development Communication focuses on the historical, current, and prospective role of communication technologies in social change, improving living conditions, and enhancing life prospects—mainly in developing countries.

U 260 Communication in the Workplace 3 cr. Offered intermittently. Explores communication skills needed in business and professional contexts. Focus on developing a working knowledge of theory and skills for interpersonal communication, group communication, and business writing. Concepts include communication processes, diversity in the workplace, nonverbal

communication, technical communication, communication with customers, and employment communication.

U 295 Special Topics Variable cr. (R-9) Offered intermittently. Experimental offerings of visiting professors, experimental offerings of new courses, or one-time offerings of current topics.

U 311 Family Communication 3 cr. Offered yearly. Prereq., COMM 110S. An examination of communication in husband-wife, parent-child, and extended family relationships. Topics include intimacy, power, decision-making, problem solving, identity formation, and interpersonal perception.

U 321 Introduction to Public Relations 3 cr. Offered yearly. The many uses of communication in the endeavor of public relations. Communication theories and models including interpersonal communication, organizational communication, and mass communication are applied to explore the internal and external communication behaviors associated with public relations.

U 322 Public Relations Portfolio 3 cr. Offered yearly. Writing documents to create relationships between organizations and their public such as press releases, fact sheets, brochures, and speeches.

U 350 Persuasive Speaking and Criticism 3 cr. Offered yearly. Prereq., COMM 111A. The persuasive process through the criticism and creation of speeches and other rhetorical artifacts emphasizing the role persuasion plays in creating and shaping our culture.

U 360 Forensics/Honors 1-3 cr. (R-12) Offered every term. Prereq., COMM 111A or COMM 242 or equiv. Preparation and participation in competitive speech and debate, including Lincoln Douglas and Parliamentary debate. The team travels to regional competitions and hosts on-campus and intramural debates and speaking events. Up to 6 credits may apply toward a major or minor in communication studies.

U 377 Rhetoric, Nature and Environmentalism 3 cr. Offered every other year. Same as ENST 377 (EVST 377). Survey of rhetorical texts that shape public understanding of nature and environmental issues. Analysis of a range of historical and contemporary environmental texts using theoretical concepts from the rhetorical tradition.

U 379 Communication, Consumption and Climate 3 cr. Offered every other year. Same as NRSM 379 (EVST 379) and CCS 379. Analyzes consumption as a communication practice, investigates discourses that promote consumption, and illuminates environmental impacts on consumption.

U 380 Gender and Communication 3 cr. Offered yearly. Same as WGS 380. The meaning of gender in our culture. Examines how gender is displayed and perpetuated through social institutions such as the media and through our private and public verbal and nonverbal interactions.

U 395 Special Topics Variable cr. (R-9) Offered intermittently. Experimental offerings of visiting professors, experimental offerings of new courses, or one-time offerings of current topics.

U 398 Internship Variable cr. (R-6) Offered autumn and spring. Prereq., consent of instr. Extended classroom experience that provides practical application of classroom learning during placements off campus. Prior approval must be obtained from the faculty supervisor and the Internship Services office. A maximum of 6 credits of Internship (198, 298, 398, 498) may count toward graduation. Offered C/NCR only.

UG 410 Communication in Personal Relationships 3 cr. Offered yearly. Prereq., COMM 110S. An examination of the functions, types, and historical context of close personal relationships with an in-depth study of the role of communication in friendships and romantic relationships.

UG 412 Communication and Conflict 3 cr. Offered autumn and spring. Conceptual and practical discussions of communication and conflict in interpersonal relationships, organizational settings and overall cultural milieu. Topics include culture, power, styles, negotiation and bargaining, mediation, dissent, dispute systems, and crisis communication. Credit is not allowed for both COMM 413 and COMM 412.

U 413 Communication and Conflict-Writing 3 cr. Offered yearly. Conceptual and practical discussions of communication and conflict in interpersonal relationships, organizational settings and overall cultural milieu. Fulfills Upper-Division Writing requirement for Communication Studies majors. Credit is not allowed for both COMM 413 and COMM 412.

UG 421 Communication in Nonprofit Organization 3 cr. Offered yearly. Prereq., COMM 230S. Focuses on issues in nonprofit organizational communication at macro and micro levels. Topics include: organizational identity, change processes, public relations, fund-raising, advocacy, socialization, stress and burnout, board management and professionalization.

UG 422 Communication and Technology in Organizations 3 cr. Offered every other year. Prereq., COMM 230S. This course takes a critical look at the influence of communication technologies on organizational communication. Students will examine how the world of work is changing due to new technologies and explore the social and ethical implications of technical innovation, adoption and use.

UG 423 Practical Issues in Organizational Communication 3 cr. Offered every year. Prereq., COMM 230S. Emphasis on the theoretical and practical issues involved in communication training and consultation. Overview of theoretical models followed by the "nuts and bolts" of communication training, development, and assessment. Students will carry out a training or consultation project (e.g., planning, execution, and evaluation) to sharpen the issues explored.

UG 424 Risk, Crisis and Communication 3 cr. Offered every other year. This course explores the communicative dynamics that both prevent and cause organizational crisis. Through case studies, the class examines how people plan, communicate and make good decisions in high-risk situations, as well as how to manage crisis public relations effectively.

UG 425 Communication and Health Organizations 3 cr. Offered every other year. This course explores the key issues at the intersection of health communication and organizational communication by considering communication processes that occur in a number of distinct contexts of health organizations. Through case studies and health campaigns students explore contemporary concerns and theory in the area of health communication.

UG 451 Intercultural Communication 3 cr. Offered autumn and spring. Communication principles and processes in cross-cultural environments. Non-Western cultures are emphasized by contrasting them to Western communication norms.

U 455 Rhetorical Criticism and Theory 3 cr. Offered yearly. Introduction to study of rhetorical criticism and theory. Current theoretical and methodological issues and approaches including traditional criticism, experiential criticism, dramatism, narrative criticism, feminist criticism, postmodern criticism.

UG 460 Communication Research Methods 3 cr. Offered autumn and spring. Prereq., a course in statistics. Introduction to the major types of communication research and the foundations of quantitative research methods.

UG 461 Research Seminar 1-3 cr. (R-9) Offered autumn and spring. coreq., COMM 460 and consent of instr. Application of quantitative and qualitative research methods to specialized contexts. Emphasis on direct student involvement in research activities.

G 480 The Rhetorical Construction of "Woman" 3 cr. Offered every other year. Same as WGS 480. Topics include the early women's rights conventions, debates over marriage and divorce, social feminism, woman suffrage in Montana, and intersections between gender and race.

UG 481 The Rhetoric of U.S. Women's Activism, 1960-1982 3 cr. Offered every other year. Same as WGS 481. Explores the rhetoric surrounding contemporary women's social "activism" in the U.S. Topics include women's rights, women's liberation, consciousness raising as a rhetorical form, reproductive rights, sexuality, and intersections between gender, race, and class.

UG 485 Communication and Health 3 cr. Offered yearly. Theory and research on the health correlates of human interaction.

UG 495 Special Topics Variable cr. (R-9) Offered intermittently. Experimental offerings of visiting professors, experimental offerings of new courses, or one-time offerings of current topics.

UG 496 Independent Study Variable cr. (R-9) Offered every term. Prereq., consent of instr. Offered C/NCR only.

G 510 Seminar in Personal Relationships 3 cr. (R-6) Offered yearly. Prereq., consent of instr. Examines theory and research on the process and functions of communication in personal relationship contexts. Interdisciplinary readings illuminates the dynamics of communication in the development, maintenance, and deterioration of romantic relationships, friendships, and family relationships. Discussion and assignments center around theoretical, methodological, and practical issues in research on communicative activities and events in personal relationships.

G 511 Survey of Interpersonal Communication 3 cr. Offered every other year. Prereq., graduate standing in communication studies or consent of instr. Survey of theories and research in interpersonal communication including definitions of interpersonal communication, its place in the field of communication, and methodological issues. Overall emphasis on foundational readings and recent research developments.

G 512 Seminar in Interpersonal Conflict 3 cr. (R-6) Offered intermittently. Prereq., consent of instr.

G 514 Alternative Dispute Resolution 3 cr. Offered yearly. Same as LAW 614. A study of the varieties of dispute resolution vehicles outside the court process. Focus on a 40-hour component of practical skills training for the mediation practitioner. Topics include the mediation model, interest-based negotiation and effective communication.

G 515 Environmental Negotiation & Mediation 3 cr. Same as NRSM 515 and ENST 515. This course prepares students to effectively engage in multiparty negotiation on natural resource and environmental issues. It is grounded in theory and provides an opportunity to develop practical skills in both negotiation and facilitation/mediation. Guest speakers, case studies, and simulations allow students to develop, test, and refine best practices. The course is face-paced, highly interactive, and serves as the second of three required courses in the Natural Resources Conflict Resolution Program.

G 520 Seminar in Organizational Communication 3 cr. Offered every other year. (R-6) Prereq., consent of instr. Introduction to theories and research in organizational communication. Topics include culture, networks, structure, technology, identity, power, resistance, gender, and globalization. Overall emphasis on foundational readings and recent research developments.

G 540 Seminar in Instructional Communication 3 cr. Offered every other year. Prereq., consent of instr. Instruction in the theories, concepts, principles, and skills employed university level classroom communication and instruction.

G 541 Teaching the Basic Course 2 cr. (R-8) Offered autumn and spring. Prereq., consent of instr. Offered C/NCR only.

G 555 Seminar in Rhetorical Criticism and Theory 3 cr. Offered annually. Introduction to contemporary issues in rhetorical criticism and theory. Methods reviewed include classical criticism, dramatism, close textual analysis, ideographic criticism, narrative criticism, feminist criticism, and postmodern criticism.

G 561 Qualitative Research Methods 3 cr. Offered every year. An emphasis on the philosophy and practice of qualitative inquiry, the development and use of descriptive frameworks, and gathering and testing qualitative data to develop human communication theory.

G 572 Family Law Mediation 2 cr. Offered autumn. Same as LAW 672. Interdisciplinary course on advanced mediation skills with a focus on family mediation including divorce and other types of family problems. Psychological issues for both children and parents, power balancing, gender issues and interest-based negotiation model.

G 575 Seminar in Rhetoric and Environmental Controversy 3 cr. Offered every other year. Same as ENST 575 (EVST 575). The study of how advocates use symbols to influence meaning and action in environmental controversies. Rhetorical theory is used to identify, analyze, and evaluate persuasive strategies and tactics.

G 585 Communication Across the Sciences 3 cr. Offered yearly. Focus on communication practices that facilitate interdisciplinary interactions across the sciences and result in more competent communication. Offered only to graduate student trainees enrolled in the M-EID program.

G 593 Professional Paper Variable cr. (R-6) Offered every term. Prereq., consent of instr.

G 594 Topical Seminar Variable cr. (R-6) Offered intermittently. Prereq., consent of instr.

G 595 Special Topics Variable cr. (R-9) Offered intermittently. Experimental offerings of visiting professors, experimental offerings of new courses, or one-time offerings of current topics.

G 596 Independent Study Variable cr. (R-9) Offered every term. Prereq., consent of instr.

G 599 Thesis Variable cr. (R-9) Offered every term. Prereq., consent of instr.

Faculty

Professors

Sara E. Hayden, Ph.D., University of Minnesota, 1994

Alan L. Sillars, Ph.D., University of Wisconsin, 1980

Betsy Wackernagel Bach, Ph.D., University of Washington, 1985

Associate Professors

Joel Iverson, Ph.D., Arizona State University, 2003

Greg Larson, Ph.D., University of Colorado, 2000

Steve Schwarze, Ph.D., The University of Iowa, 1999 (Chair)

Stephen M. Yoshimura, Ph.D., Arizona State University, 2002

Christina Yoshimura, Ph.D., Arizona State University, 2004

Lecturer

David Airne, M.A. North Dakota State University, 1998

Adjunct Instructor

Phyllis Bo-yuen Ngai, Ed.D., The University of Montana, 2004

Emeritus Professor

William W. Wilmot, Ph.D., University of Washington, 1970

Emeritus Associate Professor

James H. Polsin, Ph.D., University of Kansas, 1971

Comparative Literature

Robert Baker (Assistant Professor of English), Chair, Comparative Literature Committee

Comparative literature is the study of literature beyond the confines of one national literature. It is especially concerned with the similarities and differences which can be observed in literary works in different languages. It makes comparisons from various points of view, studying, for example, movements, periods, genres and themes in two or more national literatures. Certain types of comparative literature studies can be highly useful to students in such fields as psychology, philosophy, anthropology and history, as well as to majors in English and modern and classical languages and literatures.

Students interested in working toward a degree in comparative literature (not offered by this University) should bear in mind that a knowledge of at least two foreign languages is indispensable for advanced work. Courses in comparative literature topics are offered at The University of Montana-Missoula in several departments: English, Drama, Philosophy, Liberal Studies,

Modern and Classical Languages and Literatures, Native American Studies, and Asian Studies. For advising see the chair.

Department of Computer Science

- Special Degree Requirements
- Suggested Course of Study
- Courses
- Faculty

Yolanda Reimer, Chair

The growing utility of computers in research and education, as well as the increased impact of computers on our modern society, strongly implies that knowledge of computers and their capabilities should be a part of the basic education of all students. The courses listed below are designed to provide the student with this knowledge and to prepare the student for a career in a field in which there is a growing need for trained personnel. The objective of the undergraduate curriculum in computer science is to develop professionally competent, broadly educated computer scientists who wish to pursue professional careers or graduate studies.

The B.S. program is accredited by the Computing Accreditation Commission of ABET, 111 Market Place, Suite 1050, Baltimore, MD 21202-4012 - Telephone: 410-347-7700. For more information access our homepage <http://www.cs.umt.edu> or email the chair at yolanda.reimer@umontana.edu.

High School Preparation: In addition to general University admission requirements, pre-college preparation should include as many computer science courses as possible, and four years of high school mathematics, to include algebra, trigonometry and pre-calculus. Also recommended are physics, chemistry and biology.

Admission Requirements

Admission to computer science courses varies according to course level and other departmental standards. However, students must have completed all prerequisite courses with a grade of at least a "C-".

Lower-Division Courses

Most 100- and 200-level courses are open on a first-come, first-served basis to all students who have the prerequisites.

Upper-Division Courses

Admission to 300-level or above courses requires successful completion of the prerequisites.

Major-Minor Status

Completed change of major forms along with college transcripts must be turned in to the department when declaring computer science as a major or minor.

Special Degree Requirements

To locate graduation requirements in addition to those of the Computer Science Department, see "graduation requirements" in the index of this catalog.

Bachelor of Science degree with a major in Computer Science

A B.S. degree in computer science requires completion of the following requirements with at least a "C-" in each course (2.00 grade point average required):

Computer Science. CSCI 106 (CS 121), CSCI 135-136 (CS 131-132), CSCI 232 (CS 241), CSCI 205 (CS 242), CSCI 361 (CS 281), CSCI 332 (CS 332), CSCI 460 (CS 344), CSCI 323 (CS 346), CSCI 340 (CS 365), CSCI 315E (CS 415E), CSCI 426 (CS 441), CSCI 427 (CS 442), CSCI 466 (CS 488), and nine credits of CSCI (CS) electives selected from courses

numbered 300 and above.

Mathematics. M 171-172, 221 or 325, 225 & STAT 341 (MATH 152-153, 221 or 325, 225, and 341).

Writing/Communication. Students must take a University approved lower-division writing course. Students must also take COMM 111A or COMM 242.

Science. Students must take one of the sequences BIOB 170N-171N, 160N (BIOL 108N-109N, 110N); CHMY 141N, 143N (CHEM 161N, 162N); or PHSX 215N/216N and PHSX 217N/218N (PHYS 211N/213N and 212N/214N).

Students also must take two additional courses selected from the following list (two numbers separated by a / means that the second number is a lab for the first and the two together only count as one course for this requirement):

- ASTR 131N/134N, ASTR 132N/135N
- BIOM 250N/251N (BIOL 106N/107N), BIOB 170N/171N (BIOL 108N/109N), BIOB 160N (BIOL 110N)
- CHMY 141N, 143N (CHEM 161N, CHEM 162N)
- FOR 201
- GEO 101N, 102N (GEOS 100N/101N), GEO 226 (GEOS 226)
- PHSX 215N/216N (PHYS 211N/213N), PHSX 217N/218N (PHYS 212N/214N), PHSX 343 (PHYS 341), PHSX 444 (PHYS 444)

NOTE: 100-level CSCI (CS) courses other than CSCI 106 (CS 121), CSCI 135-136 (CS 131-132), and 200-level CSCI (CS) courses other than CSCI 205 (CS 242) and CSCI 232 (CS 241) do not count toward the degree or option requirements. However, they do count in the 60 credit limit in the major.

Upper-division Writing Expectation

Upper-division Writing Expectation for Computer Science majors is CSCI 315E (CS 415E).

Social Science, Humanities, Arts and Other Disciplines

Students must take 30 credits in social science, humanities, arts or disciplines other than computer science, mathematics and science. The courses taken to meet the Writing/Communication requirement can also count towards this requirement.

Bachelor of Science degree with a combined major in Computer Science-Mathematical Sciences

The purpose for the combined program is to provide a thorough background in both allied disciplines and to inculcate a deeper understanding of their goals and methods. A student must complete 60 credits in the two disciplines: 30 of these credits in computer science courses and 30 of these credits in mathematical sciences courses. A minimum grade of "C-" and a 2.0 grade point average is required in all courses which follow:

The computer science requirements are: CSCI 106, 135-136, 205, 232, 361, 332 (CS 121, 131-132, 242, 241, 281, 332), and nine credits of CSCI (CS) electives selected from courses numbered 300 and above. A total of at most three of the nine credits of CSCI (CS) electives may be in CSCI 398 or 498 (CS 398 or 498).

The mathematical sciences requirements are: M 171 (or 181), 172 (or 182), 221, 273, 307 (or 225) (MATH 152, 153, 221, 251, 305 (or 225)), and twelve credits of mathematical sciences electives selected from the following list: M 311, 325, 326, 361, 362, 381, 412, 414, 429, 431, 432, 439, 440, 445, 472, 473, 485 and STAT 341, 421, 422, 451, 452 (MATH 311, 325, 326, 341, 351, 381, 382, 406, 412, 414, 421, 422, 431, 441, 442, 444, 445, 451, 452, 471, 475, 485).

The combined nine additional credits of computer science electives and twelve additional credits of mathematical sciences electives must include at least three 3- or 4-credit courses numbered 400 or above, with at least one chosen from each department (not including M 429 (MATH 406), STAT 451 and 452 (MATH 444, and 445)).

Other requirements are: One of the sequences BIOB 160N, 170N, 171N (BIOL 110N, 108N-109N); or CHMY 141N, 143N (CHEM 161N, 162N); or PHSX 215N/216N and 217N/218N (PHYS 211N/213N and 212N/214N). In addition, a university approved lower-division writing course, and either COMM 111A or COMM 242.

Each student plans a program in consultation with a computer science and a mathematical sciences advisor. Students planning to attend graduate school in computer science or the mathematical sciences should consult with their respective advisors.

The upper-division writing requirement is one of the following: CSCI 315E (CS 415E), M 429 (MATH 406), any other approved General Education upper-division writing course, or a senior thesis (CSCI 499 (CS 499) or M 499 (MATH 499)).

Suggested Curricula:

Applied Math-Scientific Programming: M 311, 412, 414 (MATH 311, 412, 414), and one course chosen from STAT 341 (MATH 341), M 381, 473, 472, 440 (MATH 351, 451, 452, 471). Three courses chosen from CSCI 441, 444, 460, and 477 (CS 446, 486, 344 and 477).

Combinatorics and Optimization-Artificial Intelligence: M 361, 362 (MATH 381, 382); two courses chosen from M 325, 414, 485, and STAT 341 (MATH 325, 414, 485, 341); and CSCI 460, 446 and 447 (CS 344, 455, and 457).

Statistics-Machine Learning: STAT 341, 421 (MATH 341, 441), and two courses chosen from M 325, 362, 485, and STAT 422 (MATH 325, 382, 485, 442); three courses chosen from CSCI 340, 446, 447, 451, and 444 (CS 365, 455, 457, 458 and 486).

Algebra-Analysis: M 381, 431 (MATH 351, 421), and two courses chosen from M 326, 432, 473, 472 (MATH 326, 422, 451, 452); CSCI 460, 426 (CS 344, 441), and one other course.

Suggested Course of Study

First Year		A	S
CSCI 106 (CS 121) Careers in Computer Science		1	-
CSCI 135-136 (CS 131-132) Fundamentals of Computer Science I, II		3	3
COMM 111A Introduction to Public Speaking		3	-
WRIT 101 (ENEX 101) College Writing I		-	3
M 171, 172 (MATH 152-153) Calculus I, II		4	4
Electives and General Education		3	6
Total		14	16
Second Year		A	S
CSCI 232 (CS 241) Data Structures and Algorithms		4	-
CSCI 205 (CS 242) Programming Languages w/C/C++		-	4
CSCI 323 (CS 346) Software Science		3	-
CSCI 361 (CS 281) Computer Architecture		-	3
M 225 (MATH 225) Discrete Math I		3	-
M 221 (MATH 221) Linear Algebra		-	4
Science sequence		5	5
Total		15	16
Third Year**		A	S
CSCI 332 (CS 332) Design/Analysis of Algorithms		-	3
CSCI 460 (CS 344) Operating Systems		3	-
CSCI 466 (CS 488) Networks		-	3
CSCI 340 (CS 365) Database Design		-	3
STAT 341 (MATH 341) Introduction to Probability and Statistics		3	-
University approved lower-division writing course		-	3
Science Electives		3	3
Electives and General Education		6	-
Total		15	15
Fourth Year**		A	S
CSCI 315E (CS 415) Computers, Ethics, and Society***		3	-
CSCI 426 (CS 441) Adv Prgrmg Theory and Practice I		3	-
CSCI 427 (CS 442) Adv Prgrmg Theory and Practice II		-	3
CSCI (CS) option courses and electives		3	6
Electives and General Education		6	6
Total		15	15

**CSCI (CS) core courses at the 300- and 400-level may not always be offered in the sequence shown but will be offered every year.

***Students must pass the upper-division writing proficiency assessment and a university approved lower-division writing

course before taking CSCI 315E (CS 415E).

Requirements for a Minor

There are two minors offered by the Department of Computer Science: the traditional minor in computer science emphasizes computer programming and related skills, while the minor in computer applications emphasizes use of applications such as programming languages, word processors, spreadsheets, and data bases in the management and manipulation of electronic information.

Computer Science: To earn a minor in computer science the student must complete (with at least a "C-" in each course and a 2.00 grade average) 18 CS credits including:

1. CSCI 135-136 (CS 131-132) (6 credits).
2. 12 credits of elective courses chosen from CS 181, CSCI 100, 250, 232, 205, 361 (CS 101, 177, 181, 241, 242, 281) and courses numbered 300 and above with the restrictions: both CSCI 100 and 250 (CS 101 and 177) cannot be counted, and at least 6 credits of elective must be at the 300 level or above.
3. M 115 or M 121 and M 122 or M 151 (MATH 117 or Math 111 and MATH 112 or MATH 121)

Computer Applications: To earn a minor in computer applications, a student must complete (with at least a "C-" grade in each course and a 2.00 grade average) 21 CSCI (CS) credits including:

1. Either CSCI 100 (CS 101), CSCI 135 (CS 131) or both.
2. At least one and no more than three of CSCI 105 (CS 111), CAPP 171 (CS 171), CSCI 172 (CS 172), CSCI 250 (CS 177), and CS 181.
3. Remaining courses must be selected from CSCI 135-136 (CS 131-132), CSCI 232 (CS 241), CSCI 205 (CS 242), CSCI 444 (CS 486), other CS major courses, pre-approved CSCI 191 (CS 195), CSCI 291 (CS 295), CSCI 391 (CS 395), or CSCI 491 (CS 495) special topics courses, or up to six credits of pre-approved classes outside the department.

Courses

U = for undergraduate credit only, UG = for undergraduate or graduate credit, G = for graduate credit. R after the credit indicates the course may be repeated for credit to the maximum indicated after the R. Credits beyond this maximum do not count toward a degree.

Computer Science (CS)

U 181 Electronic Publishing on the World Wide Web 3 cr.

Computer Science (CSCI)

Students taking CSCI (CS) classes with computer programming components should expect to use additional computer lab time outside of class.

U 100 (CS 101) Introduction to Programming 3 cr. Offered autumn and spring. Elementary programming techniques using the Visual BASIC programming language. A wide range of primarily nonmathematical programs will be written by the student and run on a computer. (Two hours independent lab per week.) Credit not allowed for both CSCI 100 (CS 101) and CSCI 110 (CRT 121).

U 104 (CS 102) Programming with Alice 1 cr. Offered frequently. Classes are held for 2 hours/week in the first half of the semester. Introduction to object-oriented programming using a visual programming environment. Students create programs using drag-and-drop and these programs control animated on-screen characters and objects. Course is designed as a supplement to CSCI 135-136 (CS 131-132) which teaches object-oriented programming in a more traditional manner.

U 105 (CS 111) Computer Fluency 3 cr. Offered intermittently. Introduces the skills and concepts of information technology, both from practical and more theoretical points of view. During lectures and interactive computer labs, students explore a wide range of digital and information technologies, including common PC applications, networking, databases, privacy, and security.

U 106 (CS 121) Careers in Computer Science 1 cr. Offered autumn. Exploration of various careers available in the general area of Computer Science. Includes discussion of strategies for success in the major. Computer Science faculty members also will discuss possible undergraduate research opportunities and motivation for graduate education.

U 135 (CS 131) Fundamentals of Computer Science I 3 cr. Offered autumn and spring. Prereq., computer programming experience in a language such as BASIC, Pascal, C, etc.; coreq., M 095 (MAT 100D) or consent of instr. CSCI 104 (CS 102) highly recommended as prereq. or coreq. Fundamental computer science concepts using the high level structured programming language, Java.

U 136 (CS 132) Fundamentals of Computer Science II 3 cr. Offered autumn and spring. Prereq., CSCI 135 (CS 131); coreq., M 115 or M 151 or consent of instr. Continuation of CSCI 135 (CS 131). Survey of computer science topics including recursion, algorithms, basic data structures, operating systems, artificial intelligence, graphics, user interfaces, and social and ethical implications of computing.

U 172 (CS 172) Introduction to Computer Modeling 3 cr. Offered every term. Prereq., previous computer experience and M 095 (MAT 100D) or equiv. score on math placement test, or consent of instr. Problem solving with spreadsheets and databases using the computer to analyze a set of data; presentation of results of analysis. Credit not allowed for CRT 172 and this course.

U 191 (CS 195) Special Topics Variable cr. (R-6) Offered intermittently. Prereq., consent of instr. Experimental offerings of visiting professors, experimental offerings of new courses, or one-time offerings of current topics.

U 192 (CS 196) Independent Study Variable cr.(R-6) Offered intermittently. Prereq., consent of instr.

U 198 (CS 198) Internship Variable cr. Offered intermittently. Prereq., consent of department. Extended classroom experience which provides practical application of classroom learning during placements on and off campus. Prior approval must be obtained from the faculty supervisor and the Internship Services office. A maximum of 6 credits of Internship (198, 298, 398, 498) may count toward graduation.

U 205 (CS 242) Programming Languages w/ C/C+ 4 cr. Offered spring. Prereq., CSCI 232 (CS 241) and M 225 (MATH 225). Concepts and principles of programming languages with an emphasis on C, C++, and object-oriented programming. Syntax and semantics of object-oriented languages. Principles and implementation of late binding, memory allocation and de-allocation, type-checking, scope, polymorphism, inheritance.

U 216E Robots, Genetic Engineering, and Ethics 3 cr. An examination of ethical issues related to new technologies in the context of ethical theory in the western secular tradition. Focus will be on applying central concepts, principles, and problems of ethical theory to particular areas of technology, such as artificial intelligence and robotics, social networks, nanotechnology, genetic engineering, and privacy in a digital age.

U 232 (CS 241) Data Structures and Algorithms 4 cr. Offered autumn. Prereq., CSCI 136 (CS 132); coreq., M 225 (MATH 225) or consent of instr. Abstract data types, recursion, linked lists, trees, hashing, graphs, and applications of data structures in algorithm development. Emphasis on object oriented programming techniques.

U 250 (CS 177) Computer Modeling for Science Majors 3 cr. Offered autumn. Prereq., basic computer and spreadsheet literacy; coreq., M 162 or 171 (MATH 150 or 152). An introduction to computer modeling in the sciences using spreadsheets and a programming language. Integrates principles of math, computer science and science. A student can take at most one of CSCI 172 (CS 172), CSCI 250 (CS 177), CRT 280, and CRT 281 for credit.

U 291 (CS 295) Special Topics Variable cr. (R-6) Offered intermittently. Prereq., consent of instr. Experimental offerings of visiting professors, experimental offerings of new courses, or one-time offerings of current topics.

U 292 (CS 296) Independent Study Variable cr. (R-6) Offered intermittently. Prereq., consent of instr.

U 298 (CS 298) Internship Variable cr. (R-6) Offered intermittently. Prereq., consent of department. Extended classroom experience which provides practical application of classroom learning during placements on and off campus. Prior approval

must be obtained from the faculty supervisor and the Internship Services office. A maximum of 6 credits of Internship (198, 298, 398, 498) may count toward graduation.

U 315E (CS 415E) Computers, Ethics, and Society 3 cr. Offered autumn. Prereq., WRIT 222 (FOR 220) or university approved lower-division writing course and successful completion of the Upper-Division Writing Proficiency Assessment, or consent of instr. Ethical problems that computer scientists face. The codes of ethics of professional computing societies. The social implications of computers, computing, and other digital technologies.

U 323 (CS 346) Software Engineering 3 cr. Offered autumn. Prereq., CSCI 136 (CS 132). Study, implementation, and assessment of software processes, techniques, methods, and CASE tools. Project management and cost estimation techniques will be examined. A group project may be required.

U 332 (CS 332) Design/Analysis of Algorithms 3 cr. Offered spring. Prereq., CSCI 232 (CS 241) and M 225 (MATH 225) or consent of instr. Algorithm design, analysis, and correctness. Commonly used algorithms including searching and sorting, string search, dynamic programming, branch and bound, graph algorithms, and parallel algorithms. Introduction to NP-complete problems.

U 340 (CS 365) Database Design 3 cr. Offered spring. Prereq., CSCI 232 (CS 241) or consent of instr. Fundamentals of data modeling, the relational mode, normal forms, file organization, index structures and SQL. Major project involving the design and implementation of a relational database.

U 361 (CS 281) Computer Architecture 3 cr. Offered spring. Prereq., CSCI 136 (CS 132) or consent of instr. Functional view of computer system components, BCPU, ALU, memory, bus, cache, I/O module. Instruction set design: formats, addressing modes. Basic circuit design. Pipelining and assembly language. Interrupt handling. Implementation of ALU and control unit. Detailed design of an RISC-like instruction set. Datapath and performance comparisons. Basic multiprocessor design.

U 390 (CS 397) Research Variable cr. (R-6) Offered intermittently. Prereq., consent of instr.

U 391 (CS 395) Special Topics Variable cr. (R-6) Offered intermittently. Prereq., junior standing. Experimental offerings of visiting professors, experimental offerings of new courses, or one-time offerings of current topics.

U 392 (CS 396) Independent Study Variable cr. (R-6) Offered intermittently. Prereq., consent of instr.

U 394 (CS 394) Seminar Variable cr. (R-6) Offered intermittently. Prereq., consent of instr. Guidance in special work.

U 398 (CS 398) Internship Variable cr. (R-3) Offered intermittently. Prereq., consent of department. Business or government internship. Prior approval must be obtained from faculty supervisor and the Internship Services office. Only three credits applicable to computer science major or minor. A maximum of 6 credits of Internship (198, 298, 398, 498) may count toward graduation.

U 411 (CS 435) Advanced Web Programming 3 cr. Offered intermittently. Prereq., CSCI 136 (CS 132). Programming and software development techniques for developing web-based applications. Scripting and other programming languages that are used for web-based development.

UG 426 (CS 441) Advanced Programming Theory and Practice I 3 cr. Offered autumn. Prereq., CSCI 205, 460, 323, 340 (CS 242, 344, 346, 365) and M 225 (MATH 225), or consent of instr. Examination and implementation of modern best practices in the areas of software design, coding, testing and maintenance. Focus on design patterns and design pattern languages used to build modern software systems in a variety of areas.

UG 427 (CS 442) Advanced Programming Theory and Practice II 3 cr. Offered spring. Prereq., CSCI 426 (CS 441). Design and implementation of a major software project in a group setting, with required documentation, presentation, installation, and approval by the instructor.

U 438 Theory of Computation 3 cr. Offered intermittently. Prereq., M 225 (MATH 225) or M 307 (MATH 305). This course

focuses on understanding the limitations & capabilities of abstract models of computation, through rigorous mathematical analysis. Topics will include finite & pushdown automata, nondeterministic computation, regular expressions, generative grammars, Turing machines, undecidability, and computational complexity.

UG 441 (CS 446) Computer Graphics Programming 3 cr. Offered intermittently. Prereq., CSCI 232 (CS 241) and M 221 (MATH 221) or consent of instr. Hardware and software elements of graphics systems. Basic computer graphics algorithms for transformations, clipping, windowing and polygon filling. Straight line, circle generation. Parametrical representations of curves and surfaces. Three-D viewing. Hidden line and surface removal, shading and color models.

UG 443 (CS 476) User Interface Design 3 cr. Offered intermittently. Prereq., CSCI 232 (CS 241) or consent of instr. Introduction to usability and key concepts of human behavior. Focus on the process of user-centered design, including requirements specification, prototyping, and methods of evaluation. Incorporation of regular design critiques of classmates' work, and emphasis on both oral and written communication skills. Credit not allowed for CSCI 576 (CS 576) and this course.

UG 444 (CS 486) Data Visualization 3 cr. Offered intermittently. Prereq., M 171 (MATH 152); programming experience; and junior, senior, or graduate status; or consent of instr. Visualization fundamentals and applications using special visualization software; formulation of 3-D empirical models; translation of 3-D models into graphical displays; time sequences and pseudo-animation; interactive versus presentation techniques; special techniques for video, CD and other media.

UG 446 (CS 455) Artificial Intelligence 3 cr. Offered intermittently. Prereq., CSCI 205 (CS 242) or consent of instr. Using the computer to solve problems that require intelligence. Representation of knowledge, search techniques, symbolic programming in LISP, expert systems.

U 447 (CS 457) Machine Learning 3 cr. Offered intermittently. Prereq., CSCI 232 (CS 241) or consent of instr. Introduction to the framework of learning from examples, various learning algorithms such as neural networks, and generic learning principles such as inductive bias, Occam's Razor, and data mining. Credit not allowed for both CSCI 447 (CS 457) and CSCI 557 (CS 557).

U 448 Pattern Recognition 3 cr. Offered intermittently. Prereq., CSCI 232 (CS 241) or consent of instr. Introduction to the framework of unsupervised learning techniques such as clustering (agglomerative, fuzzy, graph theory based, etc.), multivariate analysis approaches (PCA, MDS, LDA, etc.), image analysis (edge detection, etc.), as well as feature selection and generation. Emphasis will be on the underlying algorithms and their implementation. Credit not allowed for both CSCI 448 and CSCI 548.

UG 451 (CS 458) Computational Biology 3 cr. Offered Autumn. Designed for attendance by both computer scientists and biologists. The course will explore the importance of interdisciplinary partnerships between these two fields. Students will learn to use various existing computational tools for investigating genomic and other biological data. This will include tools for performing sequence alignments and searches, building phylogenetic trees, predicting RNA secondary structure, and predicting protein tertiary structure. The underlying algorithmic approaches taken by these tools will be discussed, and in some cases, actually implemented by the class participants. The course will examine the data repositories where genomic and other biological data are stored. There will be some light programming required using PERL as the language of choice. It is assumed that the class participants have no experience programming in PERL and will learn this skill as part of the course. Credit not allowed for CSCI 558 (CS 558) and this course.

U 460 (CS 344) Operating Systems 3 cr. Offered autumn. Prereq., CSCI 232, 205, 361 (CS 241, 242, 281), or consent of instr. Operating system design principles. Processes, threads, synchronization, deadlock, memory management, file management and file systems, protection, and security. Comparison of commonly used existing operating systems. Writing programs that make use of operating system services.

UG 466 (CS 488) Networks 3 cr. Offered spring. Prereq., CSCI 232 (CS 241). Concepts and practice of computer networking, network protocol layers, switching, routing, flow, and congestion control. Network programming.

U 473 Cryptography 3 cr. Offered intermittently. Prereq., CSCI 332 (CS 332), one of M 225 (MATH 225)/ M 305, programming experience, or consent of instr. Theory and practice in modern cryptography. Statistical analysis of classical

ciphers. Design practice of modern block ciphers and hash functions, and their theoretical justifications. Linear and differential cryptanalysis. Public-key cryptography based on number-theoretic problems. Zero-knowledge proofs and secure multi-party computation protocols. Credit not allowed for both CSCI 473 and CSCI 573.

UG 477 (CS 477) Computer Simulation and Modeling 3 cr. Co-convene with CSCI 577. Prereq., M 172 (MATH 153), CSCI 135 (CS 131), or consent of instr. Matrix languages. ODE solving; Euler-Richardson, Runge-Kutta, PDE solving; finite differences, finite elements, multi-grid techniques. Discrete methods for solution, renormalization group method, critical phenomena. Emphasis on presentation of results and interactive programs. Credit not allowed for CSCI 577 (CS 577) and this course.

UG 478 (CS 478) Multimedia Data Processing 3 cr. Offered intermittently. Prereq. CSCI 232 (CS 241) or consent of instr. Introduction to fundamental concepts of multimedia data. Focus on principles and techniques of multimedia data (image, audio, and video) processing and retrieval. Implementation of multimedia applications. Credit not allowed for CS 578 and this course.

UG 490 (CS 497) Research Variable cr. (R-6) Offered intermittently. Prereq., consent of instr.

UG 491 (CS 495) Special Topics Variable cr. (R-6) Offered intermittently. Prereq., consent of instr. Experimental offerings of visiting professors, experimental offerings of new courses, or one-time offerings of current topics.

UG 492 (CS 496) Independent Study Variable cr. (R-6) Offered intermittently. Prereq., consent of instr.

UG 494 (CS 494) Undergraduate Seminar Variable cr. (R-6) Offered intermittently. Prereq., consent of instr. Guidance in special work.

U 498 (CS 498) Internship Variable cr. (R-3) Offered Intermittently. Prereq., consent of department. Business or government internship. Prior approval must be obtained from the faculty supervisor and the Internship Services office. Only three credits of CSCI 398 (CS 398) and/or CSCI 498 (CS 498) applicable to computer science major or minor. A maximum of 6 credits of Internship (198, 298, 398, 498) may count toward graduation.

U 499 (CS 499) Senior Thesis/Project 1-6 cr. (R-6) Offered every term. Prereq., consent of thesis/project director and chair of the Computer Science Department. Senior thesis for computer science majors and/or Watkins scholars.

G 511 (CS 511) Analysis, Modeling, and Design 3 cr. Offered infrequently. Prereq., CSCI 136 (CS 132) or CSCI 205 (CS 242) significant programming experience; M 115 or 151 (MATH 117 or 121); CSCI 323 (CS 346) or software engineering experience; CSCI 340 (CS 365) or database experience. Software requirements analysis, modeling, and specification. Human computer interface issues as they relate to usability, process support, productivity, and organizational goals.

G 512 (CS 512) Software Quality Assurance 3 cr. Offered intermittently. Prereq., CSCI 136 (CS 132) or CSCI 205 (CS 242) or significant programming experience; M 115 or 151 (MATH 117 or 121); CSCI 323 (CS 346) or software engineering experience. Software quality assurance concepts and implementation Planning, execution, and assessment of quality assurance activities throughout the software project life cycle.

G 521 (CS 521) Information Technology Infrastructure 3 cr. Offered infrequently. Prereq., CSCI 446 (CS 488) or IS 372 or consent of instr. Identification and classification of background environment, hardware, software, and service components in an enterprise IT environment; management and security concerns for each component; consideration of how the components fit together to form an enterprise information technology environment.

G 531 (CS 531) Design and Analysis of Algorithms 3 cr. Offered intermittently. Prereq., CSCI 332 (CS 332). Algorithm design, analysis, and correctness, with an emphasis on more advanced techniques than covered in CS 332. Design of algorithms by induction. Recurrences and their solutions. Parallel algorithms. Complexity theory: NP-hard and NP-complete problems. Approximation algorithms for intractable problems.

G 541 (CS 541) Software Science I: Requirements and Specifications 3 cr. Offered intermittently. Prereq., M 225 (MATH 225); CSCI 232 and 205 (CS 241 and 242) or consent of instr. Requirements analysis, techniques for representing

requirements, specification development techniques, and specification languages.

G 542 (CS 542) Software Science II: Design, Implementation and Testing 3 cr. Offered intermittently. Prereq., CSCI 541 (CS 541). Continuation of CSCI 541 (CS 541). The design process. Major design methods such as composite/structured design, data structure driven design, structured analysis, transfer of design to code, testing techniques, validation, verification, certification, and security.

G 548 Pattern Recognition 3 cr. Offered intermittently. Prereq., CSCI 232 (CS 241) or consent of instr. Introduction to the framework of unsupervised learning techniques such as clustering (agglomerative, fuzzy, graph theory based, etc.), multivariate analysis approaches (PCA, MDS, LDA, etc.), image analysis (edge detection, etc.), as well as feature selection and generation. Techniques in exploratory data analysis when faced with large, multivariate datasets. Opportunities at implementation of some algorithmic approaches as well as use of preexisting tools such as the R-project statistics package. Emphasis will be on the underlying algorithms and their implementation. Credit not allowed for both CSCI 448 and CSCI 548.

G 555 (CS 555) Applications in Artificial Intelligence 3 cr. (R-6) Offered intermittently. Course can be repeated for credit at the discretion of the instructor. Prereq., consent of instr. One AI application area will be investigated, such as natural language processing, expert systems, and knowledge acquisition. LISP experience is required.

G 557 (CS 557) Machine Learning 3 cr. Offered intermittently. Prereq., CSCI 232 (CS 241) or consent of instr. Fundamentals of machine learning including neural networks, decision trees, Bayesian learning, instance-based learning, and genetic algorithms; inductive bias, Occam's razor, and learning theory; data mining; software agents. Credit not allowed for CSCI 447 (CS 457) and CSCI 557 (CS 557).

G 558 (CS 558) Introduction to Bioinformatics 3 cr. Offered autumn. Prereq., consent of instr. Introduction and use of biological data sources available in the post *human genome project* era. Topics include basic algorithms for alignment of genome sequences and prediction of protein structures, as well as more advanced representational and algorithmic issues in protein structure, genome sequence computation, and systems biology. Discussion of state of the art bioinformatics projects that are being developed between the Department of Computer Science and the School of Pharmacy.

G 565 (CS 565) Database Systems 3 cr. Offered intermittently. Prereq., CSCI 205, 460 and 340 (CS 242, 344, and 365), or consent of instr. Relational database theory, data models, query languages, transaction processing, security, and concurrency.

G 573 Cryptography 3 cr. Offered intermittently. Prereq., CSCI 332 (CS 332), one of M 225 (MATH 225)/ M 305, programming experience, or consent of instr. Theory and practice in modern cryptography. Statistical analysis of classical ciphers. Design practice of modern block ciphers and hash functions, and their theoretical justifications. Linear and differential cryptanalysis. Public-key cryptography based on number-theoretic problems. Zero-knowledge proofs and secure multi-party computation protocols. Credit not allowed for both CSCI 473 and CSCI 573.

G 576 (CS 576) Human-Computer Interaction 3 cr. Offered intermittently. Prereq., CSCI 232 (CS 241) or consent of instr. Principles of good design for interactive systems and web-based applications. User-centered design methodology including requirements specification, low and high-fidelity prototyping, heuristic evaluation, cognitive walkthrough, predictive modeling, and usability testing. Advanced HCI research project. Credit not allowed for both CSCI 443 (CS 476) and CSCI 576 (CS 576).

G 577 (CS 577) Computer Simulation and Modeling 3 cr. Co-convene with CSCI 477. Prereq., M 172 (MATH 153), CSCI 135 (CS 132), or consent of instr. Matrix languages. ODE solving; Euler-Richardson, Runge-Kutta, PDE solving; finite differences, finite elements, multi-grid techniques. Discrete methods for solution, renormalization group method, critical phenomena. Emphasis on presentation of results and interactive programs. *Conduct, document, and present graduate level research involving computer simulation methods.* Credit not allowed for CSCI 477 (CS 477) and this course.

G 578 Multimedia Systems 3 cr. Offered intermittently. Prereq. CSCI 232 (CS 241) or consent of instr. Introduction to fundamental concepts of multimedia data. Focus on principles and techniques of multimedia data (image, audio, and video) processing and retrieval. Implementation of multimedia applications. Credit not allowed for CSCI 478 (CS 478) and this course.

G 580 (CS 580) Parallel Processing 3 cr. Offered intermittently. Prereq., CSCI 232, 205, and 460 (CS 241, 242, and 344). Parallel processing architectures and programming languages.

G 594 (CS 594) Graduate Seminar Variable cr. (R-6) Offered intermittently. Prereq., consent of instr. Seminar on current research topics in computer science.

G 595 (CS 595) Special Topics Variable cr. (R-6) Offered intermittently. Prereq., consent of instr. Experimental offerings of visiting professors, experimental offerings of new courses, or one-time offering of current topics.

G 596 (CS 596) Independent Study Variable cr. (R-6) Offered intermittently. Prereq., consent of instr.

G 597 (CS 597) Research Variable cr. (R-6) Offered intermittently. Prereq., consent of instr.

G 598 (CS 598) Internship Variable cr. (R-3) Offered intermittently. Prereq., consent of department. Business or government internship. Prior approval must be obtained from faculty supervisor and the Internship Services office. Only three credits applicable to computer science major or minor.

G 599 (CS 599) Thesis/Project Variable cr. (R-6) Offered every term. Prereq., consent of instr. Research for and preparation of the master thesis or professional paper.

Faculty

Professors

Ray Ford, Ph.D., University of Pittsburgh, 1980

Joel E. Henry, Ph.D., Virginia Polytechnic Institute and State University, 1993

Associate Professors

Jesse V. Johnson, Ph.D., University of Maine, Orono, 2002

Yolanda J. Reimer, Ph.D., University of Oregon, 2002 (Chair)

Assistant Professors

Min Chen, Ph.D., Florida International University, Miami, 2007

Doug Raiford, Ph.D., Wright State University, Dayton, Ohio, 2008

Mike Rosulek, Ph.D., University of Illinois, Urbana-Champaign, 2009

Research Professor

Alden H. Wright, Ph.D., University of Wisconsin, 1969

Lecturer

Mike O'Conner, M.S., University of Montana, 1996

Michael Cassens, M.S. University of Montana, 2003

College of Arts and Sciences

Christopher M. Comer, Dean

Jenny McNulty, Associate Dean

Jonathan Tompkins, Associate Dean

S. Melanie Hoell, Director of Advising

Homepage: www.cas.umt.edu

The largest and most broadly based academic unit of the University, the College of Arts and Sciences fulfills the central purpose for which the University was chartered in 1893:

"To provide the best and most efficient manner of imparting...a liberal education and thorough knowledge of the different branches of literature, science and the arts."

A liberal education gives students the means to test ideas, beliefs and facts. It empowers them to a variety of academic disciplines that will broaden and deepen their perspectives and enable them as educated citizens to continue the learning process. It teaches them how to apply what they have learned. By studying the ways of thinking and expression that are intrinsic to the arts, humanities, and social and natural sciences, students are prepared in scientific methods, critical thinking, analysis, synthesis, and cogent expression, and are helped to develop intellectual skills, humanistic understanding and aesthetic appreciation. Such an education increases the usefulness of career planning and specialization by laying a foundation for lifelong values.

A particular strength of the College is the breadth of its disciplines and programs. This breadth makes possible a varied and flexible curriculum that advances both general programs and specialized education on the undergraduate and graduate levels. Another strength is the quality of the faculty. Its members have a distinguished record of teaching, publication, service to professional societies and national organizations, and participation in consulting, extension and outreach programs. Their commitment to undergraduate liberal education is demonstrated by the quality of the graduates the College has produced. The pre professional education received here has enabled The University of Montana graduates to compete successfully for admission to graduate schools across the nation. A third strength of the College is its commitment to students as they pursue their academic studies at the University. This is reflected in close student/faculty relationships and in the continuous attention given by the College to the effect that policies, procedures, programs, and faculty and administrative structures have on students' educational experience.

Biology

- Special Degree Requirements
- Suggested Course of Study
- Courses

[This section of the catalog was edited after the catalog was published. Updated October 18, 2012.](#)

The Division offers an undergraduate degree in biology that provides a solid foundation in core areas of the biological sciences and in supporting physical sciences and mathematics. Several options are provided within the biology degree. Options in cellular and molecular biology, ecology, organismal biology, field ecology, and human biological sciences allow specialization in biological subdisciplines and are appropriate background for certain employment opportunities and for continued graduate or professional study:

Cellular and molecular biology: For students interested in the cellular and molecular aspects of biology. This option is also appropriate for students interested in medical school.

Ecology and organismal biology: For students interested in the biology of organisms (plants and animals), and populations. This option is also appropriate for students interested in veterinary school.

Field ecology: For students interested in field-based ecology. Students with this option spend one or two summers at the Flathead Lake Biological Station.

Human biological sciences: Provides a strong background in the biological sciences for students interested in pursuing further study in a health sciences professional program.