

School of Accountancy

Department Head: Richard L. Jenson

Location: Business 511

Phone: (435) 797-2335

FAX: (435) 797-1475

E-mail: maryann.clark@usu.edu

WWW: <http://www.usu.edu/cob/acct>

Director of Graduate Accounting Programs:

Cassy J. H. Budd, Business 518, (435) 797-3958,
cassybudd@cc.usu.edu

Undergraduate Advisor:

Joslyn M. Heiniger, Business 309, (435) 797-8620,
joslyn.heiniger@usu.edu

Degrees offered: Bachelor of Science (BS), Bachelor of Arts (BA) in Accounting; Master of Accounting (MAcc); participates in Master of Business Administration (MBA)

Undergraduate options: The *BS or BA in Accounting* requires selection of one of the following options: Accounting, Business Information Systems, Economics, Finance, Management or Human Resource Management, Marketing, Personal Financial Planning, or Operations Management. Many of these options qualify for a minor. A dual major in Accounting and Economics is available.

Graduate specializations: MAcc—Professional Accountancy, Taxation, Personal Financial Planning, Information Systems, and Finance. MBAs with specializations in Accounting and Personal Financial Planning are offered in the College of Business (see MBA—Accounting and MBA—Personal Financial Planning programs).

Undergraduate minors offered: Accounting and Personal Financial Planning

Undergraduate Programs

Mission

The mission of the USU School of Accountancy is to: (1) develop effective accounting and business leaders who are committed to professional excellence and ethical conduct, (2) advance accounting knowledge through theory development and accounting practice improvement, and (3) provide leadership and service to the University and professional community.

Objectives

The objective of the School of Accountancy is to provide high-quality accounting preparation for professional careers in industry, public accounting, and other organizations. The undergraduate programs are devoted to providing basic conceptual accounting, information systems, and business knowledge, along with general education, as a well-rounded foundation for career development. The fostering of high-quality student organizations is fundamental to the career-development process for on-campus programs.

The accounting curriculum is designed to help students prepare to meet changes in social, economic, and technological development. Academic course requirements for the bachelor's degrees include University Studies coursework, as well as supporting courses in mathematics, economics, business information systems, business communications, business administration, accountancy, and

information technology. The programs provide an opportunity to choose from a number of elective courses to broaden educational backgrounds and enhance employment opportunities.

Career Opportunities

Practice in the profession of accounting has become more complex, with computerized information and accounting systems becoming an integral part of the various accounting and business functions. University training is essential to prepare for high-level accounting careers in business, government, and public accounting.

Graduates of the accounting program find employment in a variety of industrial companies, nonbusiness and government agencies, and both large and small public accounting and business advisor firms. Graduates hold all levels of positions within organizations, including supervisors, managers, partners, controllers, financial vice presidents, and chief executive officers. Nonbusiness units and government agencies, such as the Utah State Auditors Office, the Federal Bureau of Investigation, and the Internal Revenue Service, provide jobs in many varied accounting functions.

Departmental Honors

See *Honors* in Business description in the College of Business section of this catalog (page 105).

Learning Objectives and Assessment

Assessment information for the School of Accountancy can be found online at: <http://www.usu.edu/cob/acct/about/assess.htm>.

Requirements

College of Business Requirements

All students majoring in accounting must satisfy the College of Business requirements, provided on pages 105-106. Academic advising about these requirements is available in the College of Business Career and Education Opportunities Center, Business 309.

Matriculation Requirement and Transfer Limitation

No more than 15 USU College of Business credits (ACCT, BA, BIS, BUS, MHR), numbered 2000 and above, earned as a nonbusiness major (before acceptance into the College of Business) can be applied to a College of Business degree. More than 15 business credits can be transferred from other accredited institutions. However, additional USU College of Business credits added to previously earned transfer business credits may not exceed a combined total of 15. Furthermore, to earn a bachelor's degree in a College of Business major, at least 50 percent of the required College of Business credits must be earned from coursework taken from the Utah State University College of Business.

USU Credits and Business Credits

At least 30 of the last 60 semester credits must be taken from Utah State University, 10 of which must be included within the last 40 credits presented for the degree. At least 50 percent of the College of Business credits required for a College of Business degree must be taken from the Utah State University College of Business or its departments, which include: School of Accountancy, Business Administration, Business Information Systems, Economics, and

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Management and Human Resources. At least 15 credits in upper-division accounting courses must be completed through the USU School of Accountancy (Logan campus).

Accounting Admission Requirements

In addition to meeting the College of Business requirements, students must have achieved a cumulative overall GPA of 3.0 or higher and have earned a grade of *B* or better in ACCT 2010 before they will be allowed to enroll in ACCT 3110 or 3310.

General Instructions for all Accounting Majors

Since some accounting courses are not offered every semester and many have prerequisites, students should plan their program at least a year ahead.

Accounting Major Requirements

For a bachelor's degree in accounting, students must complete at least 120 credits, including at least 24 credits in accounting and at least 90 credits in nonaccounting courses. At least 15 credits of upper-division accounting courses must be completed through the USU School of Accountancy (Logan Campus). To qualify for graduation as an accounting major, a student must have an accounting and an overall GPA of at least 2.5. All accounting majors are required to complete the University Studies requirements (see pages 46-54), the Pre-Business course requirements:

Pre-Business Course Requirements (13 credits)

ECON 1500 (BAI) Introduction to Economic Institutions, History, and Principles (F,Sp)	3
MATH 1100 (QL) Calculus Techniques (F, Sp, Su)	3
STAT 2300 (QL) Business Statistics (F, Sp, Su)	4
PSY 1010 (BSS) General Psychology (F, Sp, Su) (3 cr) or	
SOC 1010 (BSS) Introductory Sociology (F, Sp) (3 cr)	3

College of Business Core (37 credits)

ACCT 2010 Survey of Accounting I (F, Sp, Su).....	3
ACCT 2020 Survey of Accounting II (F, Sp, Su).....	3
BA 3400 (QI) Corporate Finance (F, Sp, Su)	3
BA 3500 Fundamentals of Marketing (F, Sp, Su).....	3
BA 3700 Operations Management (F, Sp, Su).....	3
BIS 2450 Spreadsheets and Databases for Business (F, Sp, Su)	3
BIS 2550 (CI) Business Communication (F, Sp, Su).....	3
BUS 3250 Discussions With Business Leaders (F, Sp)	1
ECON 2010 (BSS) Introduction to Microeconomics (F, Sp).....	3
ECON 3400 International Economics for Business (F, Sp, Su).....	3
MHR 2990 Legal and Ethical Environment of Business (F, Sp, Su).....	3
MHR 3110 Managing Organizations and People (F, Sp, Su)	3
MHR 4880 (CI) Business Strategy in an Entrepreneurial Context (F, Sp) (3 cr) or	
MHR 4890 (CI) Business Strategy in a Global Context (F, Sp, Su) (3 cr)	3

In addition, accounting majors must select one of the option areas below.

Accounting Major Option Areas

Option areas marked with an asterisk (*) qualify for a minor.

Accounting Option

Select 6 additional accounting credits from the following:

ACCT 5210 ¹ Accounting and Reporting for Business Combinations and International Issues (F, Su).....	3
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ACCT 5220 ¹ Accounting for Government, Nonprofit, and Other Entities and Issues (Sp, Su)	3
ACCT 5400 ¹ Income Taxation II (F, Sp).....	3

¹ACCT 5210, 5220, and 5400 or their equivalents must be completed either prior to or as part of an MAcc or MBA—Accounting degree. ACCT 6210, 6220, and 6400 should be taken at the graduate level in lieu of ACCT 5210, 5220, and 5400.

Business Information Systems Option

Complete 15 additional credits in business information systems and computer science as follows:

BIS 2300 Business Data Communications and Networking (F, Sp, Su)	3
BIS 3100 Business Information Systems (F, Sp, Su)	3
BIS 3330 Database Management (F, Sp, Su)	3
BIS 3450 Business Applications Using Visual Basic (F, Sp, Su) (3 cr) or	
BIS 3500 Management Information Systems Development (F, Sp, Su) (3 cr)	3
CS 1700 Introduction to Computer Science—CS 1 (F, Sp, Su) (3 cr) or	
CS 3410 (CI/DSC) Algorithm Development: JAVA/Internet (F, Su) (3 cr) or	
CS 3510 (QI/DSC) Algorithm Development: COBOL/Business (F) (3 cr)	3

Economics Option*

Complete 12 additional credits in economics and/or accounting as follows:

ECON 4010 Managerial Economics (F, Sp) (3 cr) or	
ECON 5010 Microeconomics (Sp) (3 cr)	3
ECON 4020 Macroeconomics for Managers (F, Sp) (3 cr) or	
ECON 5000 Macroeconomics (F) (3 cr)	3
Two additional economics or accounting courses	6

Note: If the two additional courses are selected from economics, requirements for a dual major in accounting and economics may be met.

Finance Option*

Select 12 additional credits in business administration and/or accounting from the following:

BA 4450 Financial Policy (F, Sp).....	3
BA 4460 Investments (F, Sp)	3
AND	

Two courses² chosen from the following four courses:

BA 4300 International Finance (F, Sp)	3
BA 4410 Financial Institutions (F, Sp)	3
BA 4420 Insurance (F)	3
BA 4430 Real Estate Finance (Sp)	3

²One additional accounting course may be substituted for one of the two BA courses listed in this group.

Management and Human Resource Management Option

Complete 12 additional credits in Management and Human Resource Management as follows:

MHR 3710 Developing Team and Interpersonal Skills (F, Sp).....	3
MHR 3810 Employment Law and Policy Development (F, Sp)	3
MHR 3820 International Management (F, Sp)	3
MHR 4630 Human Resource Management (F, Sp).....	3

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Marketing Option*

Complete 12 additional credits in business administration and accounting as follows:

BA 4510 Buyer Behavior (F, Sp)	3
BA 4530³ Marketing Research (F, Sp)	3
BA 4540³ Marketing Institutions (F, Sp).....	3
BA 4550 Promotion Management (F, Sp)	3

³One additional accounting course may be substituted for BA 4530 or 4540.

Personal Financial Planning Option

This option will *not* appear on student transcripts, and will *not* qualify as a minor for students majoring in Accounting. Complete 12 additional credits in personal financial planning and business administration as follows:

PFP 5060 Personal Financial Planning and Advising (F).....	3
PFP 5070 Retirement Planning (Sp)	3
PFP 5080 Estate Planning (Sp).....	3
BA 3460 Fundamentals of Personal Investing (3 cr) or	
BA 4460 Investments (F, Sp) (3 cr).....	3

Operations Management Option*

Select 12 additional credits in business administration and accounting from the following:

BA 4720 Production Planning and Control (F)	3
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AND

Three courses chosen from the following four courses:⁴

BA 3080 (QI) Operations Research (F, Sp).....	3
BA 4750 Production Simulation (Sp).....	3
BA 4790 Supply Chain Management (Sp)	3
BA 5730 Process Analysis and Improvement (F).....	3

⁴Meets requirements for a minor. There may be other courses required for a minor, but they are included in the accounting major requirements. A 2.50 GPA is generally required for courses required in a minor. Check with the department offering the minor for specific requirements.

⁴One additional ACCT course may be substituted for one of the BA courses listed in this group.

Accounting Minor (18 credits)

Students with a major in an area other than accounting may qualify for an accounting minor by completing the following 6 courses.

ACCT 2010 Survey of Accounting I (F, Sp, Su).....	3
ACCT 2020 Survey of Accounting II (F, Sp, Su).....	3
ACCT 3110 Intermediate Financial Accounting and Reporting I (F, Sp, Su)	3
ACCT 3120 Intermediate Financial Accounting and Reporting II (F, Sp, Su)	3
ACCT 3310 Strategic Cost Management (F, Sp, Su).....	3
ACCT 3410 Income Taxation I (F, Sp, Su) (3 cr) or	
ACCT 4500 Accounting Information Systems (F, Sp) (3 cr)	3

Students seeking a minor must be approved by the School of Accountancy and must achieve a 2.5 grade point average for accounting courses taken.

Personal Financial Planning Minor (15 credits)

Students seeking a minor in personal financial planning must be approved by the School of Accountancy and must achieve at least a 2.5 grade point average in the required courses. The required courses consist of 15 semester credits as follows:

ACCT 3410 Income Taxation I (F, Sp, Su)	3
PFP 5060 Personal Financial Planning and Advising (F).....	3
PFP 5070 Retirement Planning (Sp)	3
PFP 5080 Estate Planning (Sp).....	3
BA 3460 Fundamentals of Personal Investing (3 cr) or	
BA 4460 Investments (F, Sp) (3 cr).....	3

The courses above are registered with the Certified Financial Planner (CFP)® Board of Standards. Students completing these courses will qualify to sit for the comprehensive CFP® Examination.

Note: Accounting majors *cannot* qualify for a minor in personal financial planning because of a University policy prohibiting students from earning minors in the same department as their major.

Dual Major

Accounting and Economics Dual Major

Select 12 credits in economics in addition to the courses required for an accounting major from the following:

ECON 4010 Managerial Economics (F, Sp) (3 cr) or	
ECON 5010 Microeconomics (Sp) (3 cr)	3
ECON 4020 Macroeconomics for Managers (F, Sp) (3 cr) or	
ECON 5000 Macroeconomics (F) (3 cr).....	3
Upper-division Economics electives.....	6

Second Bachelor's Degree in Accounting

Students seeking a second bachelor's degree in accounting must be approved by the School of Accountancy, must achieve an accounting and overall grade point average of 2.5, and must complete the course of study listed above for an accounting major.

Beta Alpha Psi

The Delta Omega Chapter of Beta Alpha Psi, the national honorary and professional accounting fraternity, provides many professional accounting experiences for qualifying accounting students throughout their academic program.

Institute of Management Accountants

The student chapter of the Institute of Management Accountants (IMA) provides professional experiences in the area of management accounting. This organization is especially for students interested in careers in industry, not-for-profit organizations, governmental organizations, and accounting and business entrepreneurship.

Financial Planning Student Association

The Financial Planning Student Association (FPSA) provides students with opportunities to supplement classroom instruction with speakers from the financial planning industry, office visits, and internships at state and national meetings of professional associations in the financial services industry.

Additional Information

For additional information about undergraduate programs and requirements in the School of Accountancy, see the major requirement sheet, which can be obtained from the School of Accountancy, or accessed at: <http://www.usu.edu/ats/majorsheets/>

Graduate Programs

The graduate programs provide greater breadth and depth in accounting, taxation, information systems, and management to develop a high level of understanding, skill, and leadership capability to enter professional accountancy and related business careers. The Master of Accounting (MAcc) and the Master of Business Administration-Accounting Specialization (MBA-Accounting), offered by the College of Business, qualify graduates to sit for the Certified Public Accountant examination.

Admission Requirements

See general admission requirements, pages 93-94. In addition, candidates are selected based on the combined consideration of their score on the Graduate Management Admissions Test (GMAT) and their grade point average from the previous 60 semester credits (90 quarter credits) completed. Generally, 200 times the GPA plus the GMAT score must total 1,150 or more. Additionally, for MAcc Programs, the minimum acceptable GMAT score is at the 40th percentile and the minimum GPA is 3.0. In addition, scores for each section of the GMAT must be at least at the 40th percentile. For information about admission to the MBA—Accounting Specialization Program, see Admission Requirements for the MBA Program, page 178. Letters of recommendation, professional experience, professional certification, and leadership are also considered in admission decisions for all accounting graduate programs. Students may apply for admission to the graduate programs during their senior year of baccalaureate study. USU accounting students may take graduate courses during their last semester of undergraduate study, provided prerequisite courses have been completed, they have been admitted into a graduate program, and a split registration form is approved by the dean of the School of Graduate Studies. (See *Split Form Policy*, page 95.)

Students with an undergraduate degree in accounting which meets the USU undergraduate accounting program requirements have completed all of the preparatory work for graduate study. Students with less than the equivalent of the undergraduate program are expected to make up the deficiencies. The director of Graduate Accounting Programs will assist in necessary program scheduling. Students are encouraged to satisfy undergraduate deficiencies by taking equivalent graduate business administration, management and human resources, and economics core courses when possible.

Graduate students are expected to maintain an overall GPA of 3.0 to remain in the program.

Complete information relative to the details of the program and course scheduling is available from the School of Accountancy.

Graduate Degree Programs

MAcc requirements for students who have an undergraduate accounting major or equivalent (33 credits)

Program of Study

Students matriculated in the Master of Accounting degree must complete an approved program of study consisting of at least 33 credits. This program must include completion of the Foundation Requirements, the MAcc Core Requirements, and one of the Areas of Specialization Requirements. At least 15 credits must be earned in approved Accounting courses numbered 6000 or above. Details for each requirement type are provided in the following paragraphs.

Foundation Requirements

Students who have not completed undergraduate coursework in Corporate Income Taxation (ACCT 5400 or equivalent) must include ACCT 6400 in their MAcc program of study. Students who have not completed undergraduate coursework in both Accounting for Business Combinations (ACCT 5210 or equivalent) and Accounting for Government and Nonprofit Entities (ACCT 5220 or equivalent) must include the 6000-level offering of the omitted course in their MAcc program of study.

MAcc Core Requirements

The core courses required for this degree include: ACCT 6410, 6510, 6550, 6610, 6800; and PFP 6560.

Master of Accounting Specializations

In addition to meeting the Foundation Requirements and MAcc Core Requirements, students complete requirements for one of the following specializations:

Professional Accountancy Specialization

Required courses for this specialization are: ACCT 6350, 6500, 6540, and 6600.

Taxation Specialization

Required courses for this specialization are: ACCT 6420, 6440, 6460, and one course chosen from PFP 6060, 6070, or 6080.

Personal Financial Planning Specialization

Students must complete PFP 6060, 6070, 6080, and one course chosen from ACCT 6420, 6440, or 6460. In addition, students must complete, or have previously completed, the equivalent of BA 3460 or 4460 (neither of these courses count as part of the 33-credit MAcc degree requirement). This specialization satisfies the requirements to sit for the national Certified Financial Planner (CFP) examination.

Information Systems Specialization

Students must complete ACCT 6500, 6600, and an additional 6 credits of approved systems-related courses.

Finance Specialization

Complete ACCT 6350, plus 9 credits selected from approved finance-related courses.

Accelerated Program for Nonaccounting Undergraduate Majors

MAcc for nonaccounting undergraduate majors (54 to 68 credits)

Candidates for this program must score at or above the 50th percentile on all sections of the GMAT and have a 3.3 minimum GPA for the last 60 semester credits. This program requires the successful completion of the Integrative Pre-MBA Core (14 credits), which is offered summer semester only, plus an additional 54 credits. Students with undergraduate degrees in business subjects (other than accounting)

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need not take the Integrative Pre-MBA Core and therefore may earn the MAcc in 54 credits. The 54 credits include: ACCT 3110, 3120, 3310, 3410, 4510, the Foundation Requirements, the MAcc Core Requirements, and one of the MAcc areas of specialization.

MBA—Accounting Specialization

Students admitted to the MBA Program may earn an Accounting Specialization by completing the MBA Advanced Required Courses, 18 credits (see MBA program description, page 178), and by completing at least 12 approved 6000-level accounting credits as part of their MBA program of study. To qualify for this specialization, students must complete, or have previously completed, the equivalent of ACCT 3110, 3120, 3310, 3410, 4510, 5210 (or 6210), 5220 (or 6220), 5400 (or 6400), 6510, and 6610.

MBA—Personal Financial Planning Specialization

Students admitted to the MBA Program may earn a Personal Financial Planning Specialization by completing the MBA Advanced Required Courses, 18 credits (see MBA program description, page 178), and the following: PFP 6060, 6070, 6080; ACCT 3410 or 6400; and BA 3460 or 4460. This specialization satisfies requirements to sit for the national Certified Financial Planner (CFP) examination.

Financial Assistance

Financial assistance is available in the form of President's Fellowships, Graduate School Fellowships, graduate assistantships, and special School of Accountancy scholarships. Applications for assistance should be made after the application for admission to the School of Graduate Studies is filed, but before March 1 of each year. Application forms are available from the School of Accountancy, and the awards are normally announced by April 15.

Professional Organizations and Activities

Graduate students are encouraged to participate in professional organizations, such as the USU chapters of Beta Alpha Psi (National Honors Fraternity for Financial Information Professionals), the Institute of Management Accountants, and the Financial Planning Student Association. The Federation of Schools of Accountancy, the American Institute of Certified Public Accountants, the Utah Association of Certified Public Accountants, and other professional organizations sponsor professional activities for accounting graduate students.

Accountancy Faculty

ATK Thiokol Professor

Richard L. Jensen, systems

Larzette G. Hale Professor

I. Richard Johnson, financial, business combinations

Richard C. and Vera C. Stratford Professor

David H. Luthy, systems

Arthur Andersen Alumni Professor

Richard L. Ratliff, auditing, financial, internal audit

Ernst & Young Professor

Clifford R. Skousen, international, managerial, financial

Arthur Andersen Executive Professor

Jay H. Price, Jr., financial, governmental, business combinations

Adjunct Professor

M. Kay Jeppesen, government contract accounting and administration

Professors Emeritus

James W. Brackner

Frank A. Condie

Larzette G. Hale

Associate Professors

E. Vance Grange, financial planning and tax

Irvin T. Nelson, accounting education, financial, managerial

Assistant Professors

Cindy Durtschi, financial, forensic

Rosemary R. Fullerton, financial, managerial

Garth F. Novack, tax

Principal Lecturer

Franklin D. Shuman, financial, managerial, governmental, business combinations

Lecturers

Cassy J. H. Budd, tax and financial

Jack W. Peterson, financial

Dale G. Siler, business law and tax

Course Descriptions

Accounting (ACCT), pages 445-446

Personal Financial Planning (PFP), page 571

Department of Aerospace Studies

Department Head: Lt. Colonel Jeffery S. Bateman

Location: Military Science 107

Phone: (435) 797-8723

FAX: (435) 797-8733

E-mail: afrotc@hass.usu.edu

WWW: <http://www.usu.edu/afrotc>

Undergraduate Programs

Objectives

Air Force ROTC provides educational experiences that develop skills and attitudes vital to the career of an Air Force officer. The purpose of the course is to give an understanding of the mission and the global responsibilities of the United States Air Force. The academic phase develops background in national and international affairs to help understand and evaluate world events.

In addition, the curriculum includes experiences designed to stimulate and develop an interest in the Air Force (e.g., orientation flights and visits to Air Force bases); opportunities to apply the principles of leadership, human relations, management, and staff work in practical situations; and other related experiences.

Requirements

Physical Fitness and Medical

All students must meet the physical fitness and medical standards for general military service.

Age Limitations

To qualify as a pilot or navigator, students must be able to finish the aerospace studies program and graduate from the University before age 29 years. Other students must complete the military program and graduate from the University prior to reaching the age of 30. Age waivers are available up to age 35.

Academic Requirements

Successful completion of the four-, three-, two-, or one-year Air Force ROTC program is required to be commissioned as a Second Lieutenant in the U.S. Air Force. Aerospace Studies classes are taken in addition to the classes required for a bachelor's degree. In some cases, ROTC classes may be taken in conjunction with a master's degree program. The program taken is based on the number of years remaining until graduation (e.g., a transfer student with two years remaining until graduation would enroll in the two-year program). The courses, along with the normal schedule for taking them for each of the programs, are listed below:

Four-Year Program

First year:

AS 1010 Introduction to the Air Force Today	1
AS 1110 Leadership Laboratory I	1
AS 1020 Introduction to the Air Force Today	1
AS 1120 Leadership Laboratory I	1

Second year:

AS 2010 The Evolution of U.S. Aerospace Power	1
AS 2110 Leadership Laboratory II	1
AS 2020 The Evolution of U.S. Aerospace Power	1
AS 2120 Leadership Laboratory II	1

Third year:

AS 3400 Field Training (4 weeks)	1-4
AS 3010 Air Force Leadership and Management	3
AS 3110 Leadership Laboratory III	1
AS 3020 Air Force Leadership and Management	3
AS 3120 Leadership Laboratory III	1

Fourth year:

AS 4010 National Security Affairs/Preparation for Active Duty	3
AS 4110 Leadership Laboratory IV	1
AS 4020 National Security Affairs/Preparation for Active Duty	3
AS 4120 Leadership Laboratory IV	1

Three-Year Program

First year:

AS 1010 Introduction to Air Force Today	1
AS 1110 Leadership Laboratory I	1
AS 2010 The Evolution of U.S. Aerospace Power	1
AS 2110 Leadership Laboratory II	1
AS 1020 Introduction to the Air Force Today	1
AS 1120 Leadership Laboratory I	1
AS 2020 The Evolution of U.S. Aerospace Power	1
AS 2120 Leadership Laboratory II	1

Second year:

AS 3400 Field Training (4 weeks)	1-4
AS 3010 Air Force Leadership and Management	3
AS 3110 Leadership Laboratory III	1
AS 3020 Air Force Leadership and Management	3
AS 3120 Leadership Laboratory III	1

Third year:

AS 4010 National Security Affairs/Preparation for Active Duty	3
AS 4110 Leadership Laboratory IV	1
AS 4020 National Security Affairs/Preparation for Active Duty	3
AS 4120 Leadership Laboratory IV	1

Two-Year Program

First year:

AS 3500 Field Training (5 weeks)	1-5
AS 3010 Air Force Leadership and Management	3
AS 3110 Leadership Laboratory III	1
AS 3020 Air Force Leadership and Management	3
AS 3120 Leadership Laboratory III	1

Second year:

AS 4010 National Security Affairs/Preparation for Active Duty	3
AS 4110 Leadership Laboratory IV	1
AS 4020 National Security Affairs/Preparation for Active Duty	3
AS 4120 Leadership Laboratory IV	1

One-Year Program

AS 3500 Field Training (5 weeks)	1-5
AS 4010 National Security Affairs/Preparation for Active Duty	3
AS 4110 Leadership Laboratory IV	1
AS 4020 National Security Affairs/Preparation for Active Duty	3
AS 4120 Leadership Laboratory IV	1

Summer Training

AS 3500 is a prerequisite for cadets entering the Air Force ROTC two-year program. Training will be given at an Air Force base and will last five weeks. Up to five university credits may be granted for this training.

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All cadets in the three- and four-year programs will attend a four-week summer training camp. Attendance at this camp is usually between the sophomore and junior year at a selected Air Force base. Up to 4 credits may be granted for this training.

Leadership Laboratory

A Leadership Laboratory period is required each week during the fall and spring semesters for each year of aerospace studies. Interested students should check the current *Schedule of Classes* for the Leadership Laboratory schedule.

Minor

A minor in Aerospace Studies may be awarded upon completion of commissioning requirements.

Veterans

A veteran may apply for the Air Force ROTC program if he or she can complete the program prior to reaching age 30, with a year for year waiver up to age 35 for each year of active duty service. (The waiver does not apply to the maximum age at graduation to enter flight training of 29.) The general military course (first two years) may be waived for prior military service. However, veterans must successfully complete AS 3400 prior to entering the two-year program.

Additional Information

For additional details about requirements for the Aerospace Studies program, see the major requirement sheet, which can be obtained from the department, or accessed at:

<http://www.usu.edu/ats/majorsheets/>

Scholarships and Financial Aid

Scholarships

Air Force ROTC scholarships are available on a competitive basis. These scholarships pay all or part of tuition and fees, a textbook allowance, and a monthly nontaxable stipend during the school year. High school seniors must apply for four-year scholarships prior to December of their senior year. In-college scholarships can be applied for while enrolled in Air Force ROTC.

Uniforms and Texts

All Air Force ROTC texts and uniforms are furnished at no expense to the student.

Miscellaneous Information

Career Opportunities

To meet the challenges, keep up with technological advancements, and explore the opportunities of the ever-broadening horizons in the aerospace age, officers possessing a variety of skills are required by the Air Force. Interested students should contact the Aerospace Studies Department for information on the Air Force career opportunities related to their academic major.

Aerospace Studies Faculty

Professor

Lt. Colonel Jeffery S. Bateman

Assistant Professors

Captain James Lovewell, Commandant of Cadets

Major Walter D. Martin, Unit Admissions Officer

Information Manager

Technical Sergeant Holly A. Huff

Director of Personnel

Staff Sergeant Jessica L. Bruckner

Course Descriptions

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Department of Agricultural Systems Technology and Education

Department Head: Bruce E. Miller
Location: Agricultural Systems Technology and Education 101C
Phone: (435) 797-2230
FAX: (435) 797-4002
E-mail: bruce.miller@usu.edu
WWW: <http://www.aste.usu.edu>

Agricultural Systems Technology and Agricultural Education Advisor:

Eric B. Worthen, ASTE 117, (435) 797-7091, eric.worthen@usu.edu

Agricultural Machinery Technology Advisor:

Evan P. Parker, ASTE 137, (435) 797-1928, epparker@cc.usu.edu

Family and Consumer Sciences Education Advisor:

Betty J. Murri, Family Life 303A, (435) 797-1565, betty.murri@usu.edu

Degrees offered: Bachelor of Science (BS) in Agricultural Education; BS, Master of Science (MS) in Agricultural Systems Technology; BS in Family and Consumer Sciences Education; Associate of Applied Science (AAS) in Agricultural Machinery Technology; One-year Certificate in Agricultural Machinery Technology

Undergraduate emphases: BS—*Agricultural Systems Technology*: Agribusiness and Agricultural Mechanization

Graduate specializations: MS—*Agricultural Extension Education*, Agricultural Mechanization, Family and Consumer Sciences Education and Extension, International Agricultural Extension, and Secondary/Postsecondary Agricultural Education

Undergraduate Programs

Objectives

The programs offered in the Agricultural Systems Technology and Education Department are for students who are preparing for positions as family and consumer sciences or agricultural education teachers, as well as for positions in family and consumer sciences education or agricultural extension, agricultural mechanization, agribusiness, and agricultural production and management.

The facilities for these programs include laboratories with specially designed equipment for practical instruction in agricultural systems and mechanization, including computer applications, agribusiness, agricultural buildings, engines, electricity, hydraulics, machinery, and repair welding. Family and Consumer Sciences Education students use laboratories equipped for instruction in secondary education, clothing production, textile science, early childhood, nutrition, and interior design.

Requirements

Departmental Admission Requirements

Admission requirements for the Department of Agricultural Systems Technology and Education are the same as those described for the University on pages 16-19. Students in good standing may apply for admission to the department.

Bachelor of Science in Agricultural Education

Preparation in Agricultural Education includes technical agriculture, economics, and business. Students selecting the teaching option will also enroll in principles and techniques of teaching courses.

Students interested in teaching agricultural production and processing, agricultural mechanics, horticulture, or natural resources will be guided into areas of their major interest. Agricultural backgrounds or summer agricultural experiences are necessary for teacher certification.

An application for admission to teacher education should ordinarily be completed before the junior year (see College of Education and Human Services requirements, page 108). Approval for admission to teacher education is a prerequisite to enrollment in education and psychology courses. A 2.75 GPA is required for admission to the teacher education program.

Requirements for the **Bachelor of Science in Agricultural Education** are listed briefly. For more detailed information on courses and the recommended sequence for taking them, see the major requirement sheet available from the Agricultural Systems Technology and Education Department.

The Agricultural Education major involves four teaching areas, which correspond with the Utah agricultural education program model design. Students must complete the University Studies requirements (see pages 46-54). In addition, students must complete the following courses in preparation for teacher licensure:

Professional Education (14 credits)

SCED 3100 Motivation and Classroom Management (F,Sp)	3
SCED 3210 (CI/DSS) Educational and Multicultural Foundations (F,Sp).....	3
SCED 4200 (CI) Reading, Writing, and Technology (F,Sp)	3
SCED 4210 Cognition and Evaluation of Student Learning (F,Sp)	3
SPED 4000 Education of Exceptional Individuals (F,Sp,Su)	2

Agricultural Education (26 credits)

ASTE 2710 Orientation to Agricultural Education (F).....	2
ASTE 3100 Leadership Applications in Agricultural Science, Management, and Development (Sp)	2
ASTE 3240 (CI) Teaching in Laboratory Settings (Sp).....	3
ASTE 3300 Clinical Experience I in Agricultural Education (Sp).....	1
ASTE 3620 Managing the FFA and SAE Programs (Sp,Su).....	2
ASTE 4150 (CI) Methods of Teaching Agriculture (F)	3
ASTE 4300 Clinical Experience II in Agricultural Education (F).....	1
ASTE 5500 Agricultural Education Secondary Curriculum Seminar (Sp).....	2
ASTE 5630 Agricultural Education Student Teaching in Secondary Schools (Sp).....	10

All students in the Agricultural Education major will complete a core of technical agricultural courses to include:

ASTE 1010 Introduction to Agricultural Systems Technology (F).....	3
ASTE 3050 (CI) Technical and Professional Communication Principles in Agriculture (F,Sp)	3
ASTE 3080 Compact Power Units for Agricultural and Turfgrass Applications (Sp)	3
ADVS 1110 Introduction to Animal Science (F,Sp).....	4
BIOL 1110 Elementary Microbiology (F)	4
BIOL 1210 Biology I (F).....	4
CHEM 1110 (BPS) General Chemistry I (F,Sp).....	4
SOIL 3000 Fundamentals of Soil Science (F,Sp).....	4

Students are required to designate a program emphasis for the following areas: Production and Processing; Agricultural Systems; Horticulture; and Natural Resources. Approximately 50 credits in a technical agriculture specialization are required in each of the four program area choices.

Department of Agricultural Systems Technology and Education

Emphasis Areas (50-57 credits)

These emphasis areas will *not* appear on a student's transcript. They are emphasis areas approved by the Utah State Office of Education.

Production and Processing (50 credits)

ADVS 1110 Introduction to Animal Science (F,Sp)	4
ADVS 4560 (QI) Principles of Animal Breeding (F)	3
ASTE 2200 Electricity in Agricultural Systems (Sp)	3
ASTE 2830 Agribusiness Sales and Marketing (F)	3
ASTE 3030 Metal Welding Processes and Technology in Agriculture (F)	3
ASTE 3040 (QI) Fabrication Practices in Agricultural Buildings (Sp)	2
ASTE 3050 (CI) Technical and Professional Communication Principles in Agriculture (F,Sp)	3
ASTE 3080 Compact Power Units for Agricultural and Turfgrass Applications (Sp)	3
BIOL 1210 Biology I (F)	4
CHEM 1110 (BPS) General Chemistry I (F,Sp)	4
ECON 3030 (DSS) Introduction to Agribusiness Marketing (F) (3 cr) or	
ECON 3050 (DSS) Introduction to Agribusiness Management (Sp) (3 cr)	3
PLSC 3050 Greenhouse Management and Crop Production (Sp)	4
PLSC 3700 Plant Propagation (F)	4
PLSC 4280 Field Crops (F)	3
SOIL 3000 Fundamentals of Soil Science (F,Sp)	4

Horticulture (57 credits)

ADVS 1110 Introduction to Animal Science (F,Sp)	4
ASTE 2830 Agribusiness Sales and Marketing (F)	3
ASTE 3040 (QI) Fabrication Practices in Agricultural Buildings (Sp)	2
ASTE 3050 (CI) Technical and Professional Communication Principles in Agriculture (F,Sp)	3
ASTE 3080 Compact Power Units for Agricultural and Turfgrass Applications (Sp)	3
BIOL 1210 Biology I (F)	4
CHEM 1110 (BPS) General Chemistry I (F,Sp)	4
PLSC 2200 Pest Management Principles and Practices (Sp)	3
PLSC 2600 Annual and Perennial Plant Materials (F)	1.5
PLSC 2610 Indoor Plants and Interiorscaping (F)	1.5
PLSC 2620 Woody Plant Materials: Trees and Shrubs for the Landscape (F)	3
PLSC 2650 Identification and Selection of Plants in Production Agriculture (F)	1
PLSC 3010 Basic Flower Arranging (F)	2
PLSC 3050 Greenhouse Management and Crop Production (Sp)	4
PLSC 3300 Residential Landscapes (Sp)	3
PLSC 3700 Plant Propagation (F)	4
PLSC 3800 Turfgrass Management (F)	3
PLSC 4500 Fruit Production (Sp)	4
SOIL 3000 Fundamentals of Soil Science (F,Sp)	4

Agricultural Systems (57 credits)

ADVS 1110 Introduction to Animal Science (F,Sp)	4
ASTE 1010 Introduction to Agricultural Systems Technology (F)	3
ASTE 1640 Agricultural Equipment and Parts Marketing and Communications (F)	3
ASTE 2200 Electricity in Agricultural Systems (Sp)	3
ASTE 3030 Metal Welding Processes and Technology in Agriculture (F)	3
ASTE 3040 (QI) Fabrication Practices in Agricultural Buildings (Sp)	2
ASTE 3050 (CI) Technical and Professional Communication Principles in Agriculture (F,Sp)	3
ASTE 3080 Compact Power Units for Agricultural and Turfgrass Applications (Sp)	3

ASTE 3200 Irrigation Principles and Practices (Sp)	3
ASTE 3600 (QI) Management of Agricultural Machinery Systems (Sp)	3
ASTE 4100 Agricultural Structures and Environment (Sp)	3
ASTE 5100 Electrical Controls and Motors for Agri-Industrial Applications (Sp)	3
ASTE 5260 (CI) Environmental Impacts of Agricultural Systems (F)	3
CHEM 1110 (BPS) General Chemistry I (F,Sp)	4
ECON 3030 (DSS) Introduction to Agribusiness Marketing (F) (3 cr) or	
ECON 3050 (DSS) Introduction to Agribusiness Management (Sp) (3 cr)	3
PHYX 1200 (BPS) Introduction to Physics by Hands-on Exploration	4
PLSC 4280 Field Crops (F)	3
SOIL 3000 Fundamentals of Soil Science (F,Sp)	4

Natural Resources (55 credits)

ADVS 1110 Introduction to Animal Science (F,Sp)	4
ASTE 3040 (QI) Fabrication Practices in Agricultural Buildings (Sp)	2
ASTE 3050 (CI) Technical and Professional Communication Principles in Agriculture (F,Sp)	3
ASTE 3080 Compact Power Units for Agricultural and Turfgrass Applications (Sp)	3
ASTE 5260 (CI) Environmental Impacts of Agricultural Systems (F)	3
BIOL 1210 Biology I (F)	4
BIOL 1220 (BLS) Biology II (Sp)	4
BIOL 2220 General Ecology (F,Sp)	3
CHEM 1110 (BPS) General Chemistry I (F,Sp)	4
ENVS 2340 (BSS) Natural Resources and Society (F,Sp)	3
ENVS 3600 Living with Wildlife (Sp)	3
FRWS 3600 Wildland Plant Ecology and Identification (F)	4
FRWS 3610 Wildland Animal Ecology and Identification (F)	4
FRWS 3900 Managing Dynamic Ecological Systems (Sp)	4
FRWS 4000 Principles of Rangeland Management (Sp)	3
SOIL 3000 Fundamentals of Soil Science (F,Sp) (4 cr) or	
SOIL 4000 Soil and Water Conservation (F) (4 cr)	4

Bachelor of Science in Agricultural Systems Technology (AST)

This major has two emphases: *Agribusiness* and *Agricultural Mechanization*. Preparation in either emphasis includes technical agriculture, economics, and business. The agricultural mechanization emphasis requires additional courses in technical electives and communication skills development.

The Bachelor of Science in Agricultural Systems Technology includes the following courses:

Technical Requirements (20 credits)

ACCT 2010 Survey of Accounting I (F,Sp,Su)	3
CHEM 1110 (BPS) General Chemistry I (F,Sp)	4
ECON 1500 (BAI) Introduction to Economic Institutions, History, and Principles (F,Sp)	3
ECON 3030 (DSS) Introduction to Agribusiness Marketing (F)	3
ECON 3050 (DSS) Introduction to Agribusiness Management (Sp)	3
SOIL 3000 Fundamentals of Soil Science (F,Sp)	4

Communications Intensive Courses (6 credits)

ASTE 3050 (CI) Technical and Professional Communication Principles in Agriculture (F,Sp)	3
ASTE 5260 (CI) Environmental Impacts of Agricultural Systems (F)	3

Department of Agricultural Systems Technology and Education

Agricultural Systems Courses (minimum of 23 credits)

ASTE 1010 Introduction to Agricultural Systems Technology (F).....	3
ASTE 2200 Electricity in Agricultural Systems (Sp)	3
ASTE 2830 Agribusiness Sales and Marketing (F)	3
ASTE 3030 Metal Welding Processes and Technology in Agriculture (F).....	3
ASTE 3080 Compact Power Units for Agricultural and Turfgrass Applications (Sp)	3
ASTE 3090 Computer Applications in Agriculture (F,Sp)	3
ASTE 4100 Agricultural Structures and Environment (Sp).....	3
ASTE 4900 Senior Project Research and Creative Opportunity (Sp).....	1-6

Designated Electives (minimum of 24 credits)

Select 24 credits from the following courses. Twelve of these credits must be selected from upper-division (3000-level and above) courses.

ASTE 1610 Agricultural Machinery Engines (F).....	6
ASTE 1620 Agricultural Machinery Power Trains (Sp).....	6
ASTE 3040 (QI) Fabrication Practices in Agricultural Buildings (Sp)....	2
ASTE 3100 Leadership Applications in Agricultural Science, Management, and Development (Sp)	2
ASTE 3200 Irrigation Principles and Practices (Sp).....	3
ASTE 3600 (QI) Management of Agricultural Machinery Systems (Sp).....	3
ASTE 3900 Special Problems in Agricultural Systems Technology and Education (F,Sp,Su)	1-6
ASTE 4250 Occupational Experiences in Agriculture (F,Sp,Su)	1-6
ASTE 5100 Electrical Controls and Motors for Agri-Industrial Applications (Sp)	3
ADVS courses	6-12
ACCT courses	6-12
ECON courses (Agricultural)	6-12
MHR courses.....	6-12
BA courses	6-12
BIS courses	6-12
PLSC courses	6-12
SOIL courses.....	6-12

Electives (maximum of 11 credits)

Total Credits for Graduation..... 92

Students will complete a minor in Business or Agribusiness. Additional requirements in Animal Science; Plant and Soil Sciences; and Forest, Range, and Wildlife Sciences must also be met. In addition, students must complete the University Studies Requirements.

Agricultural Systems Technology and Agribusiness Composite Major Economics Courses (27 credits)

ECON 1500 (BAI) Introduction to Economic Institutions, History, and Principles (F,Sp)	3
ECON 1550 (BSS) Introduction to Environmental and Natural Resource Economics (F).....	3
ECON 3030 (DSS) Introduction to Agribusiness Marketing (F).....	3
ECON 3050 (DSS) Introduction to Agribusiness Management (Sp)	3
ECON 4010 (DSS) Managerial Economics (F,Sp)	3
ECON 4030 (CI) Agribusiness Finance (F)	3
ECON 5030 Agricultural Marketing and Price Analysis (F)	3
ECON 5050 Farm and Ranch Planning and Analysis (Sp)	3
ECON 5350 (CI) Agribusiness, Cooperatives, and Management (Sp).....	3

Agricultural Systems Courses (24 credits)

ASTE 1010 Introduction to Agricultural Systems Technology (F).....	3
ASTE 2200 Electricity in Agricultural Systems (Sp)	3
ASTE 3030 Metal Welding Processes and Technology in Agriculture (F) (3 cr) or	
ASTE 4100 Agricultural Structures and Environment (Sp) (3 cr)	3
ASTE 3050 (CI) Technical and Professional Communication Principles in Agriculture (F,Sp)	3
ASTE 3090 Computer Applications in Agriculture (F,Sp)	3
ASTE 3200 Irrigation Principles and Practices (Sp) (3 cr) or	
ASTE 3080 Compact Power Units for Agricultural and Turfgrass Applications (Sp) (3 cr).....	3
ASTE 3600 (QI) Management of Agricultural Machinery Systems (Sp).....	3
ASTE 5260 (CI) Environmental Impacts of Agricultural Systems (F)	3

Technical Requirements (27 credits)

ACCT 2010 Survey of Accounting I (F,Sp,Su).....	3
ACCT 2020 Survey of Accounting II (F,Sp,Su).....	3
CHEM 1010 (BPS) Introduction to Chemistry (F,Sp)	3
MATH 1050 (QL) College Algebra (F,Sp,Su).....	4
MATH 1100 (QL) Calculus Techniques (F,Sp,Su)	3
MHR 2990 Legal and Ethical Environment of Business (F,Sp,Su).....	3
SOIL 4000 Soil and Water Conservation (F).....	4
STAT 2300 (QL) Business Statistics (F,Sp,Su)	4

University Studies Requirements

(not met as part of above requirements) (18 credits)

Communications Literacy (CL) courses	6
Breadth Creative Arts (BCA) course.....	3
Breadth Humanities (BHU) course	3
Breadth Life Sciences (BLS) course	3
Depth Humanities and Creative Arts (DHA) course	3
Computer and Information Literacy (CIL) Exam.....	0

General Electives (24 credits)

Total Credits for Graduation..... 120

Associate of Applied Science Degree in Agricultural Machinery Technology

The Associate of Applied Science Degree in Agricultural Machinery Technology consists of a minimum of 6 credits of University Studies courses, 45 credits in the major (Agricultural Systems Technology and Education), 9 credits in business or related elective coursework, for a total of not less than 60 credits. The suggested breakdown of coursework is listed below.

University Studies (6 credits)

Classes will be selected from a minimum of two areas for a total of 6 credits. ENGL 1010, Introduction to Writing: Academic Prose (or an equivalent writing or communications class) must be completed as one of these classes.

Core Classes (45 credits)

The following 45 credits are required:

ASTE 1010 Introduction to Agricultural Systems Technology (F).....	3
ASTE 1120 Forage and Harvest Equipment (F)	3
ASTE 1130 Planting and Tillage Equipment (Sp).....	3
ASTE 1610 Agricultural Machinery Engines (F).....	6
ASTE 1620 Agricultural Machinery Power Trains (Sp).....	6
ASTE 2200 Electricity in Agricultural Systems (AC) (Sp).....	3
ASTE 3030 Metal Welding Processes and Technology in Agriculture (F).....	3

Department of Agricultural Systems Technology and Education

ASTE 3080 Compact Power Units for Agricultural and Turfgrass Applications (Sp)	3
ASTE 3090 Computer Applications in Agriculture (F,Sp)	3
ASTE 3600 Management of Agricultural Machinery Systems (Sp)	3
ASTE 3710 Agricultural Machinery Hydraulic Systems and Diagnosis (F)	3
ASTE 3720 Agricultural DC Electrical Systems and Diagnosis (F)	3
ASTE 3730 Agricultural Machinery Auxiliary Systems and Diagnosis (Sp).....	3

Business or Related Elective Classes (select 9 credits)

ADVS 1110 Introduction to Animal Science (F,Sp).....	4
ASTE 2250 Occupational Experience in Agriculture (F,Sp)	5
ASTE 2830 Agribusiness Sales and Marketing (F)	3
ASTE 2900 (BSS) Humanity in the Food Web (F,Sp).....	3
ASTE 2930 Individualized Projects in Agricultural Mechanics (F,Sp).1-3	
ASTE 3040 Fabrication Practices in Agricultural Buildings (Sp)	2
ASTE 3050 Technical and Professional Communication Principles in Agriculture (F,Sp).....	3
ASTE 3090 Computer Applications in Agriculture (F,Sp)	3
ASTE 3100 Leadership Applications in Agricultural Science, Management, and Development (Sp)	2
ASTE 3200 Irrigation Principles and Practices (Sp).....	3
ASTE 3900 Special Problems in Agricultural Systems Technology and Education (F,Sp,Su)	1-6
ASTE 4100 Agricultural Structures and Environment (Sp)	3
ASTE 5100 Electrical Controls and Motors for Agri-Industrial Applications (Sp)	3
ASTE 5260 Environmental Impacts of Agricultural Systems (F)	3
AWER 1200 (BLS) Biodiversity: Its Conservation and Future (F).....	3
BIOL 1210 Biology I (F).....	4
CHEM 1110 (BPS) General Chemistry I (F,Sp).....	4
FRWS 4000 Principles of Rangeland Management (Sp)	3
MATH 1030 (QL) Quantitative Reasoning (F,Sp).....	3
NR 1010 (BSS) Humans and the Changing Global Environment (F,Sp).....	3
PHYX 1200 (BPS) Introduction to Physics by Hands-on Exploration ...	4
PLSC 2200 Pest Management Principles and Practices (Sp)	3
PLSC 2620 Woody Plant Materials: Trees and Shrubs for the Landscape (F)	3
PLSC 2650 Identification and Selection of Plants in Production Agriculture (F).....	1
PLSC 3050 Greenhouse Management and Crop Production (Sp)	4
PLSC 3300 Residential Landscapes (Sp).....	3
PLSC 3400 Landscape Management Principles and Practices (F)	3
PLSC 3800 Turfgrass Management (F)	3
PLSC 5550 Weed Biology and Control (F).....	4

Elective Courses

Students should select credits approved by the Agricultural Systems Technology and Education Department for flexibility in strengthening areas of insufficient background.

A total of 60 credits are required.

Agricultural Machinery Technology Certificate

This one-year agricultural program meets the needs of persons interested in employment opportunities with agricultural dealerships and companies in the areas of parts and service, as well as with farm suppliers, feed and fertilizer agencies, corporate farms and ranches, and other related industries. The vocationally oriented agricultural technology program includes a cooperative occupational experience placement at the end of the first year of instruction.

Requirements for the one-year program include a minimum of 31 credits, with the following breakdown of suggested coursework:

Fall Semester

ASTE 1010 Introduction to Agricultural Systems Technology	3
ASTE 1120 Forage and Harvest Equipment	3
ASTE 1610 Agricultural Machinery Engines	6
ASTE 3090 Computer Applications in Agriculture	3
ASTE 3710 Agricultural Machinery Hydraulic Systems and Diagnosis.....	3

Spring Semester

ASTE 1130 Planting and Tillage Equipment	3
ASTE 1620 Agricultural Machinery Power Trains	6
ASTE 2250 Occupational Experience in Agriculture	1-6
ASTE 3080 Compact Power Units for Agricultural and Turfgrass Applications	3

See major requirement sheet, available from the department, for more information.

Minor in Agricultural Systems Technology

A minimum of 18 credits approved by a faculty advisor are required.

Bachelor of Science in Family and Consumer Sciences Education (FCSE)

This major provides professional preparation for teaching Family and Consumer Sciences Education and Occupational Family and Consumer Sciences Education in public schools, or for employment as a family and consumer scientist in business or government agencies, and extension. Many states, including Utah, require a master's degree to work for extension.

This composite major includes study in nutrition and food sciences, family and human development, interior design, housing, apparel and textiles, and consumer sciences, plus professional education courses.

Student teaching in secondary public schools is required. Internships in extension or business are available.

The following courses are required for the Family and Consumer Sciences Education Major.

Required Support Courses and Prerequisites

MATH 1050 (QL) College Algebra (F,Sp,Su).....	4
CHEM 1110 (BPS) General Chemistry I (F)	4
CHEM 1120 (BPS) General Chemistry II (Sp)	4

Major Required Courses (88 credits)

A grade of C or better must be earned in these courses

FCHD 1500 (BSS) Human Development Across the Lifespan (F,Sp)...	3
FCHD 2400 (BSS) Marriage and Family Relationships (F,Sp).....	3
FCHD 2450 (BSS) The Consumer and the Market (F,Sp)	3
FCHD 3350 (DSS/QI) Family Finance (F,Sp).....	3
FCHD 4550 Preschool Methods and Curriculum (F,Sp).....	3
FCHD 4960 Practice Teaching in Child Development Laboratories (F,Sp,Su) (3 cr) or	
FCSE 4250 Internship in Family and Consumer Sciences Education (F,Sp,Su) (1-3 cr).....	1-3
FCSE 2040 Clothing Production Principles (F,Sp)	3
FCSE 2510 Orientation to Family and Consumer Sciences Education (F).....	3
FCSE 3030 (DSC) Textile Science (Sp)	4
FCSE 3040 Advanced Clothing Production Principles (F,Sp)	3

Department of Agricultural Systems Technology and Education

FCSE 3060 (DSS/CI) Human Behavior Related to Dress (F)	3
FCSE 3300 Family and Consumer Sciences Education Clinical Experience I (40 hrs. minimum) (F)	1
FCSE 3400 Family and Consumer Sciences Education Methods I (F) .3	
FCSE 4300 Family and Consumer Sciences Education Clinical Experience II (40 hrs. minimum) (Sp)	1
FCSE 4400 Family and Consumer Sciences Education Methods II (Sp)	3
FCSE 5500 Student Teaching Seminar (2 weeks) (F)	2
FCSE 5630 Student Teaching in Secondary Schools (13 weeks, full-time) (F)	10
ID 1790 (BCA) Interior Design Theory (Sp)	3
ID 3790 Architectural Systems (F)	3
INST 3500 Technology Tools for Secondary Teachers (F,Sp,Su)	1
NFS 1020 (BLS) Science and Application of Human Nutrition (F,Sp,Su)	3
NFS 1240 Culinary Basics (F,Su)	3
NFS 2020 Nutrition Throughout the Life Cycle (Sp)	3
NFS 4070 Experimental Foods (Sp)	4
SCED 3100 Motivation and Classroom Management (F,Sp)	3
SCED 3210 (DSS/CI) Educational and Multicultural Foundations (F,Sp)	3
SCED 4200 (CI) Reading, Writing, and Technology (F,Sp)	3
SCED 4210 Cognition and Evaluation of Student Learning (F,Sp)	3
SPED 4000 Education of Exceptional Individuals (F,Sp,Su) (May be taken anytime)	2

Departmental Honors

Students who would like to experience greater academic depth within their major are encouraged to enroll in departmental honors. Through original, independent work, Honors students enjoy the benefits of close supervision and mentoring, as they work one-on-one with faculty in select upper-division departmental courses. Honors students also complete a senior project, which provides another opportunity to collaborate with faculty on a problem that is significant, both personally and in the student's discipline. Participating in departmental honors enhances students' chances for obtaining fellowships and admission to graduate school. Minimum GPA requirements for participation in departmental honors vary by department, but usually fall within the range of 3.30-3.50. Students may enter the Honors Program at almost any stage in their academic career, including at the junior (and sometimes senior) level. The campus-wide Honors Program, which is open to all qualified students regardless of major, offers a rich array of cultural and social activities, special classes, and the benefit of Honors early registration. Interested students should contact the Honors Program, Merrill Library 374, (435) 797-2715, honors@cc.usu.edu. Additional information can be found online at: <http://www.usu.edu/honors/>

Additional Information

For further information about undergraduate programs and requirements in the Department of Agricultural Systems Technology and Education, see the major requirement sheets, which can be obtained from the department, or accessed online at: <http://www.usu.edu/ats/majorsheets/>

Graduate Programs

Admission Requirements

See general admission requirements, pages 93-94. Applications will be considered throughout the year. However, students who wish to be

considered for financial aid must apply by February 1 for the coming academic year. No application will be considered until all required information arrives at the office of the School of Graduate Studies.

Course Requirements

Master of Science

The MS program requires the completion of a minimum of 33 credits beyond the bachelor's degree. These credits must be approved by a supervisory committee. However, to optimize a student's academic experiences, 36 credits are recommended. A 15-credit core curriculum is required and includes courses in research/statistics and completion of a Plan A thesis for 6 credits or a Plan C program with a minimum of 37 credits. Students are also expected to select and complete an area of specialization.

In the Family and Consumer Sciences Education and Extension specialization, a Plan B option is available. This plan involves 33 credits of instruction (includes 3 thesis credits) and the development and presentation of a creative project.

The following four specializations are available for the MS in Agricultural Education:

The **Agricultural Extension Education** specialization provides a program for individuals interested in cooperative extension work. The curriculum for the program includes coursework related to managing people; planning, implementing, and evaluating programs to promote technology transfer (adult education); understanding research techniques relevant to agricultural education; and the managing of fiscal affairs.

Electives are selected from each of the following departments: Agricultural Systems Technology and Education; Animal, Dairy and Veterinary Sciences; Economics; Biology; Plants, Soils, and Biometeorology; Forest, Range, and Wildlife Sciences; and Instructional Technology.

The purpose of the **Family and Consumer Sciences Education and Extension** specialization is to expand academic preparation in an area of study such as family studies, housing, textiles and clothing, nutrition and food sciences, and management of personal resources. This specialization places emphasis on teaching and curriculum/program development and/or Extension. Students are prepared for community professions, including secondary teaching (since students earn a teaching license), urban and rural extension, social science, and business. Study may lead to supervisory and administrative positions in business, technical schools, and applied technology colleges, or to consulting positions in mass media and industry. The master's degree *does not* result in a teaching license for public schools.

The **International Agricultural Extension** specialization was developed to prepare agriculturally educated people to perform administrative and supervisory roles in less-developed countries. The curriculum for this program includes coursework related to managing people; planning, implementing, and evaluating programs to promote technology transfer; and managing fiscal affairs. Electives are selected from each of the following departments: Agricultural Systems Technology and Education; Animal, Dairy and Veterinary Sciences; Economics; Biology; Plants, Soils, and Biometeorology; and Instructional Technology.

Department of Agricultural Systems Technology and Education

Research

The Utah Agricultural Experiment Station, a component of the College of Agriculture, supports graduate work in several areas of Agricultural Systems Technology and Education. Other state and federal agencies also support research in agricultural systems.

Financial Assistance

Both departmental and formal grant support are available to graduate students and are awarded on a competitive basis. Students requesting financial support should apply to the department.

Research assistantships are available through faculty members who have ongoing projects with the Utah Agricultural Experiment Station or who hold special research grants from the University, private companies, or state-federal agencies. Acceptance to pursue graduate study does not guarantee the student financial assistance.

Requirement Changes

Graduation requirements described in this catalog are subject to change. Students should check with their departments concerning possible changes.

Agricultural Systems Technology and Education Faculty

Professors

Bruce E. Miller, agricultural systems and mechanization
Weldon S. Sleight, extension education
Gary S. Straquadine, agricultural education/extension

Adjunct Professor

Kevin C. Kesler, 4-H and youth development programs

Professor Emeritus

Gilbert A. Long, agricultural education

Associate Professor

F. Richard Beard, research and extension, agricultural engineering

Assistant Professors

John D. Harrison, agricultural waste management/extension specialist
Rhonda L. Miller, sustainable agriculture/agricultural systems
Rudy S. Tarpley, agricultural education, teacher preparation
Nancy Thompson, family and consumer sciences education
Brian K. Warnick, agricultural education, teacher preparation

Instructor

Betty J. Murri, apparel and textiles

Lecturers

Evan P. Parker, agricultural technology and machinery management
Daryl L. Reece, agricultural engineering and equipment repair
Afifa Sabir, education and outreach, Biotechnology Center
Julie P. Wheeler, family and consumer sciences education

Academic Advisor

Eric B. Worthen

Course Descriptions

Agricultural Systems Technology and Education (ASTE),
pages 446-449

Family and Consumer Sciences Education (FCSE), pages 516-517

Department of Animal, Dairy and Veterinary Sciences

Department Head: Mark C. Healey

Location: Agricultural Science 230

Phone: (435) 797-2162

FAX: (435) 797-2118

E-mail: advsdept@adv.susu.edu

WWW: <http://www.advs.susu.edu>

Associate Head:

Thomas D. Bunch, Agricultural Science 220, (435) 797-2148,
tombunch@cc.susu.edu

Undergraduate Advisor for Animal Science and Dairy Science majors:

Tami Spackman, Agricultural Science 242, (435) 797-2150,
tami.spackman@susu.edu

Undergraduate Advisor for Bioveterinary Science majors:

Stanley D. Allen, Veterinary Science 211, (435) 797-1900,
sallen@cc.susu.edu

Graduate Programs Coordinator:

Jeffrey L. Walters, Agricultural Science 246, (435) 797-2161,
jeffrey.walters@susu.edu

Degrees offered: Bachelor of Science (BS) and Bachelor of Arts (BA) in Animal Science, Dairy Science, Bioveterinary Science; Master of Science (MS) in Animal Science, Bioveterinary Science, Dairy Science; Doctor of Philosophy (PhD) in Animal Science and Bioveterinary Science; MS and PhD degrees in Toxicology are available through the Interdepartmental Toxicology program

Undergraduate Emphases: *Animal Science*—Animal Industries, Biotechnology, Science; *Dairy Science*—Dairy Industries, Science; *Bioveterinary Science*—Biotechnology

Graduate Specializations: *Animal/Dairy Science*—Animal Nutrition, Breeding and Genetics, Molecular Biology, Reproductive Biology, Animal or Dairy Management (MS only); *Bioveterinary Science (PhD only)*—Parasitology, Toxicology, Virology

Certificate Program: Dairy Herdsman

Undergraduate Programs

Objectives

Bachelor's degree students majoring in animal science may choose a program from three career emphasis areas: **Science, Animal Industries**, or **Biotechnology**. Students majoring in dairy science may choose a program from two career emphasis areas: **Science** or **Dairy Industries**. The curricula in the animal and dairy sciences are designed to prepare students for a broad base of rewarding careers in the dynamic disciplines of animal agriculture. Teaching and research facilities, flocks, and herds are available for "hands-on" practical laboratory experiences, along with faculty-mentored research projects. An assigned faculty advisor helps students develop, arrange, and expedite their personal undergraduate program.

Preveterinary bachelor's degree programs are intended to prepare students for admission to professional veterinary medical schools and/or graduate study in the biomedical sciences. A preveterinary bachelor's degree is considered a nonterminal degree. Preveternary students may earn a bachelor's degree in bioveterinary science, or in the science emphasis of animal science or dairy science.

Instruction in the ADVS Department also encompasses a diversified co-curricular program including allied clubs, intercollegiate livestock judging and rodeo teams, and involvement with their respective professional societies.

Animal and Dairy Sciences

Science Emphasis

Designed for students desiring education beyond the bachelor's degree, this emphasis is a preparatory course of study for students who have a career interest in the following areas: animal research in genetics; reproductive biology, nutrition (public or private sector); biotechnology; teaching; and advanced degrees (MS, PhD, and veterinary school). The science emphasis requires an especially close student-advisor relationship, as post-graduate training is considered essential for professional success in these disciplines.

Animal (Dairy) Industries Emphasis

This emphasis is designed to prepare students who earn a bachelor's degree for the broadest range of career opportunities in animal agriculture. The Animal Industries Emphasis stresses both traditional skills in the areas of basic and applied animal sciences and related learning experiences in the other agricultural sciences, as well as in the areas of business administration, economics, and management. Students can select either an advanced research project or an internship experience in the animal industries as an integral component of their program of study during the junior or senior year. Graduates from this emphasis may seek career opportunities in production animal agriculture in farm or ranch management, in state or federal government agricultural agencies, and in fields that support or interact with animal agriculture, such as corporate agribusiness, wholesale and retail marketing and sales, economics, accounting, agricultural real estate sales and appraisal, financing and credit operations, public policy, agricultural media and communications, insurance, commodity trading, animal product processing, agricultural cooperatives, and producer/commodity associations.

Animal and Bioveterinary Sciences

Biotechnology Emphasis

This emphasis is designed to prepare students who earn a bachelor's degree for careers in the expanding biotechnology industry or for graduate study in related fields. Nationwide there are more than 1,200 biotechnology/ biopharmaceutical companies, with additional start-ups developing every year. Recent increases in federal funding for research in animal biotechnology, along with heightened private sector activity, have led to unprecedented career prospects in molecular biology, genomics, bioinformatics, developmental biology, and associated areas. USU has made a major commitment to biotechnology since 1986. The ADVS Department is heavily involved in biotechnology research and teaching, and the resources of the Center for Integrated BioSystems are also available to support this emphasis.

Those students who enjoy lab work and would like to have a BS degree with good job opportunities, and still qualify to apply to veterinary school, may elect to add the Biotechnology Emphasis in Bioveterinary Science to their degree.

Preveterinary Program

Preveterinary students take courses required by veterinary schools. Classes should be planned to assure meeting the current requirements for the veterinary schools to which the student plans to apply for admission. In most cases, preveterinary preparation requires a major

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portion of three academic years. Students accepted into veterinary school prior to completion of their BS degree may transfer credits back to USU for completion of their BS degree in bioveterinary science.

Utah participates in WICHE (Western Interstate Commission for Higher Education) which provides state subsidization of Utah resident (5 years or longer at the time of application) students entering any veterinary school that is a WICHE-participating school. At present this includes Colorado State University, Washington State University, Oregon State University, and University of California at Davis. The State of Utah also provides some support for a limited number of resident students who enroll at non-WICHE veterinary schools in the continental United States. Students may also apply to other veterinary schools as out-of-state applicants.

Vocational Subbaccalaureate Program

Dairy Herdsman Certificate

Students completing the required courses and experience in the Dairy Herdsman's curriculum usually find employment with a commercial or family dairy. Some enter dairy-related businesses. Students desiring to continue their dairy education may complete a BS degree in three additional years with proper planning and suitable academic performance.

Requirements

Departmental Admission Requirements

Undergraduate admission requirements for the animal science and dairy science programs are the same as those described for the University. Students in good standing may apply for admission to the department. New freshmen admitted to USU in good standing qualify for admission to the bioveterinary science major. Students with less than 60 semester credits transferring from other institutions need a 2.2 transfer GPA, and students with less than 60 semester credits transferring from other USU majors need a 2.0 GPA for admission to the bioveterinary science major. All students with 60 or more semester credits need a 2.75 total GPA to be admitted to advanced standing in bioveterinary science, except that students declaring a biotechnology emphasis must have a 2.25 total GPA.

Departmental Standards

The following minimum requirements apply to all students working toward any bachelor's degree offered by the ADVS department. Bachelor's degree candidates must comply with these requirements in order to graduate: (1) courses required for the major may be repeated only once to improve a grade, and (2) courses required for the major may not be taken for pass-fail credit. In addition to these requirements, animal science and dairy science bachelor's degree candidates must attain a grade point average of at least 2.50 in the ADVS courses specified as requirements in their respective emphasis curricula to graduate. Animal science and dairy science degree candidates must attain an overall GPA of at least 2.25 to graduate. Bioveterinary science degree candidates must attain an overall GPA of at least 3.0 to graduate, *except* for students with a biotechnology emphasis, who must attain an overall GPA of at least 2.50 to graduate.

Graduation Requirements

Courses required and recommended for meeting BS degree graduation requirements in the various options available in the department are as follows.

Animal Science Major

Animal Industries Emphasis Curriculum (2.25 GPA) Freshman Year (32.5-33.5 credits)

Fall Semester (16.5-17.5 credits)

ADVS 1110 Introduction to Animal Science	4
ADVS 1910 Orientation to Animal and Dairy Science	0.5
ADVS 2130 ⁵ Dairy Production Practices (3 cr) or	
ADVS 2190 ⁵ Horse Production Practices (2 cr)	2 or 3
BIOL 1010 (BLS) Biology and the Citizen	3
MATH 1050 (QL) College Algebra	4
Breadth Course ¹	3

Spring Semester (16 credits)

ADVS 1250 (QI) Applied Agricultural Computations	2
ADVS 2200 Anatomy and Physiology of Animals	4
ENGL 1010 (CL) Introduction to Writing: Academic Prose	3
ECON 1500 (BAI) Introduction to Economic Institutions, History, and Principles	3
ADVS 2080 ⁵ Beef Production Practices (2 cr) and/or	
ADVS 2090 ⁵ Sheep Production Practices (2 cr) and/or	
ADVS 2120 ⁵ Swine Production Practices (2 cr)	4

Sophomore Year (32-33 credits)

Fall Semester (16-17 credits)

CHEM 1110 (BPS) General Chemistry I	4
STAT 1040 (QL) Introduction to Statistics (3 cr) or	
STAT 2000 (QI) Statistical Methods (3 cr) or	
STAT 2300 (QL) Business Statistics (4 cr)	3 or 4
ENGL 2010 (CL) Intermediate Writing: Research Writing in a Persuasive Mode	3
Directed Elective	3
Breadth Course ¹	3

Spring Semester (16 credits)

ADVS 3000 Animal Health and Hygiene	3
ASTE 3050 (CI) Technical and Professional Communication Principles in Agriculture	3
CHEM 1120 (BPS) General Chemistry II	4
Directed Elective ³	3
Breadth Course ¹	3

Junior Year (31 credits)

Fall Semester (15 credits)

ADVS 3500 Principles of Animal Nutrition	3
Directed Electives ³	9
Free Elective	3

Spring Semester (16 credits)

ADVS 3510 (QI) Applied Animal Nutrition	3
ADVS 4200 (CI) Physiology of Reproduction and Lactation	4
ADVS 4250 Internship in Animal Industry (3 cr) or	
ADVS 4800 Undergraduate Research or Creative Opportunity (3 cr) ..	3
Depth Course ²	3
Directed Elective ³	3

Senior Year (25.5-34.5 credits)

Fall Semester (14.5 credits)

ADVS 4560 (QI) Principles of Animal Breeding	3
ADVS 4910 Preprofessional Orientation	0.5
ADVS 4920 (CI) Undergraduate Seminar	2
ADVS 5120 ⁴ Swine Management	3
Depth Course ²	3
Directed Electives ³	3-6

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Spring Semester (11-20 credits)

ADVS 5080⁴ Beef Cattle Management (3 cr) and/or	
ADVS 5090⁴ Sheep Management and Wool Technology (4 cr) and/or	
ADVS 5130⁴ Dairy Cattle Management (3 cr) and/or	
ADVS 5190⁴ Horse Management (3 cr)	3-7
Directed Electives ³	8-13

¹Must take one Breadth course from each of the following four categories: Creative Arts, Humanities, Physical Sciences, and Social Sciences. (Note: ECON 1500 fulfills the American Institutions Breadth Course requirement.)

²Must take one Depth course from each of the following two categories: Humanities and Creative Arts, and Social Sciences.

³Must take four courses from the following list: ACCT 2010; BA 3400, 3500, 3700; ECON 2010, 3030, 3050, 4010, 4030, 5030; MHR 2990, 3110; and six courses from the following list: one 5000-level species management course in addition to the two courses required for the major; ADVS 3650, 5030, 5520, 5530, 5860; NFS 5020; PLSC 4320; FRWS 2200, 3600, 3850, 4000; SOIL 2000 or 3000.

⁴Must take two courses selected from: ADVS 5080, 5090, 5120, 5130, and 5190.

⁵Must take any three courses selected from: ADVS 2080, 2090, 2120, 2130, and 2190.

Animal Science: Science Emphasis Science Emphasis Curriculum (2.25 GPA)

Freshman Year (30.5 credits)

Fall Semester (16.5 credits)

ADVS 1110 Introduction to Animal Science	4
ADVS 1910 Orientation to Animal and Dairy Science	0.5
CHEM 1210 Principles of Chemistry I	4
CHEM 1230 Chemical Principles Laboratory I	1
MATH 1050 (QL) College Algebra	4
ENGL 1010 (CL) Introduction to Writing: Academic Prose	3

Spring Semester (14 credits)

ADVS 2200 Anatomy and Physiology of Animals	4
CHEM 1220 (BPS) Principles of Chemistry II	4
CHEM 1240 Chemical Principles Laboratory II	1
ADVS 2080⁹ Beef Production Practices (2 cr) and/or	
ADVS 2090⁹ Sheep Production Practices (2 cr) and/or	
ADVS 2120⁹ Swine Production Practices (2 cr)	2-6
Breadth Course ⁶	3

Sophomore Year (31-32 credits)

Fall Semester (14-15 credits)

ADVS 2130⁹ Dairy Production Practices (3 cr) or	
ADVS 2190⁹ Horse Production Practices (2 cr)	2 or 3
BIOL 1210 Biology I	4
CHEM 2310 Organic Chemistry I	4
CHEM 2330 Organic Chemistry Laboratory I	1
ENGL 2010 (CL) Intermediate Writing: Research Writing in a Persuasive Mode	3

Spring Semester (17 credits)

ADVS 3000 Animal Health and Hygiene	3
BIOL 1220 (BLS) Biology II	4
CHEM 2320 Organic Chemistry II	4
Breadth Courses ⁶ (2)	6

Junior Year (33-34 credits)

Fall Semester (16-17 credits)

ADVS 3500 Principles of Animal Nutrition	3
BIOL 3300 General Microbiology	4
MATH 1100 (QL) Calculus Techniques (3 cr) or	
MATH 1210 (QL) Calculus I (4 cr)	3 or 4
STAT 2000 (QI) Statistical Methods	3
Breadth Course ⁶	3

Spring Semester (17 credits)

ADVS 3510 (QI) Applied Animal Nutrition	3
ADVS 4200 (CI) Physiology of Reproduction and Lactation	4

BIOL 3200 (QI) Principles of Genetics	4
CHEM 3700 Introductory Biochemistry	3
Elective ⁸	3

Senior Year (27.5-31.5 credits)

Fall Semester (15.5 credits)

ADVS 4560 (QI) Principles of Animal Breeding	3
ADVS 4910 Preprofessional Orientation	0.5
ADVS 4920 (CI) Undergraduate Seminar	2
ADVS 5120¹⁰ Swine Management	3
Depth Course ⁷	3
Electives ⁸	4-7

Spring Semester (12-16 credits)

ADVS 4250 Internship in Animal Industry (3 cr) or	
ADVS 4800 Undergraduate Research or Creative Opportunity (3 cr) ..	3
ADVS 5080¹⁰ Beef Cattle Management (3 cr) and/or	
ADVS 5090¹⁰ Sheep Management and Wool Technology (4 cr) and/or	
ADVS 5130¹⁰ Dairy Cattle Management (3 cr) and/or	
ADVS 5190¹⁰ Horse Management (3 cr)	3-7
Depth Course ⁷	3
Electives ⁸	3

⁶Must take one Breadth course from each of the following four categories: American Institutions, Creative Arts, Humanities, and Social Sciences.

⁷Must take one Depth course from each of the following two categories: Humanities and Creative Arts, and Social Sciences.

⁸Recommended electives include: ADVS 5160, 5240, 5260; CHEM 3710; PHYX 2110.

⁹Must choose two courses from: ADVS 2080, 2090, 2120, 2130, and 2190.

¹⁰Must choose two courses from: ADVS 5080, 5090, 5120, 5130, and 5190.

Biotechnology Emphasis Curriculum (2.25 GPA)

Freshman Year (32.5 credits)

Fall Semester (16.5 credits)

ADVS 1110 Introduction to Animal Science	4
ADVS 1910 Orientation to Animal and Dairy Science	0.5
CHEM 1210 Principles of Chemistry I	4
CHEM 1230 Chemical Principles Laboratory I	1
MATH 1050 (QL) College Algebra	4
ENGL 1010 (CL) Introduction to Writing: Academic Prose	3

Spring Semester (16 credits)

ADVS 2040 Introduction to Biotechnology	1
ADVS 2200 Anatomy and Physiology of Animals	4
CHEM 1220 (BPS) Principles of Chemistry II	4
CHEM 1240 Chemical Principles Laboratory II	1
STAT 1040 (QL) Introduction to Statistics (3 cr) or	
STAT 2000 (QI) Statistical Methods (3 cr)	3
Breadth Course ¹¹	3

Sophomore Year (29 credits)

Fall Semester (15 credits)

BIOL 1210 Biology I	4
CHEM 2310 Organic Chemistry I	4
CHEM 2330 Organic Chemistry Laboratory I	1
ENGL 2010 (CL) Intermediate Writing: Research Writing in a Persuasive Mode	3
Breadth Course ¹¹	3

Spring Semester (14 credits)

BIOL 1220 (BLS) Biology II	4
CHEM 2320 Organic Chemistry II	4
Breadth Courses ¹¹ (2)	6

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Junior Year (32 credits)

Fall Semester (16 credits)

BIOL 3300 General Microbiology	4
MATH 1100 (QL) Calculus Techniques	3
Directed Electives ¹²	6
Depth Course ¹³	3

Spring Semester (16 credits)

ADVS 3200 (DSC) Ethical Issues in Genetic Engineering and Biotechnology	3
ADVS 5160 ¹⁴ Methods in Biotechnology: Cell Culture (3 cr) or	
ADVS 5240 ¹⁴ Methods in Biotechnology: Protein Purification Techniques (3 cr)	3
BIOL 3200 (QI) Principles of Genetics	4
CHEM 3700 Introductory Biochemistry	3
Depth Course ¹³	3

Senior Year (26.5 credits)

Fall Semester (14.5 credits)

ADVS 4910 Preprofessional Orientation	0.5
ADVS 4920 (CI) Undergraduate Seminar	2
ADVS 5260 ¹⁴ Methods in Biotechnology: Molecular Cloning	3
Directed Electives ¹²	6
Free Elective	3

Spring Semester (12 credits)

ADVS 4260 Internship in Animal Biotechnology Industry	12
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¹¹Must take one Breadth course from each of the following four categories: American Institutions, Creative Arts, Humanities, and Social Sciences.

¹²Must take 12 credits from the following list of courses: ADVS 3000, 3500, 3510, 4200, 4560, 5490, 5820; one 5000-level Methods in Biotechnology course in addition to the two required for the major; BIOL 5150, 5210, 5230; PHYX 2110, 2120.

¹³Must take one Depth course from each of the following two categories: Humanities and Creative Arts, and Social Sciences.

¹⁴Must choose two courses from: ADVS 5160, 5240, 5260.

Dairy Science Major

Dairy Industries Emphasis Curriculum (2.25 GPA)

Freshman Year (29.5 credits)

Fall Semester (14.5 credits)

ADVS 1110 Introduction to Animal Science	4
ADVS 1910 Orientation to Animal and Dairy Science	0.5
ADVS 2130 Dairy Production Practices	3
BIOL 1010 (BLS) Biology and the Citizen	3
MATH 1050 (QL) College Algebra	4

Spring Semester (15 credits)

ADVS 1250 (QI) Applied Agricultural Computations	2
ADVS 2200 Anatomy and Physiology of Animals	4
ENGL 1010 (CL) Introduction to Writing: Academic Prose	3
ECON 1500 (BAI) Introduction to Economic Institutions, History, and Principles	3
Breadth Course ¹⁵	3

Sophomore Year (29-31 credits)

Fall Semester (13-14 credits)

CHEM 1110 (BPS) General Chemistry I	4
ENGL 2010 (CL) Intermediate Writing: Research Writing in a Persuasive Mode	3
STAT 1040 (QL) Introduction to Statistics (3 cr) or	
STAT 2000 (QI) Statistical Methods (3 cr) or	
STAT 2300 (QL) Business Statistics (4 cr)	3 or 4
Breadth Course ¹⁵	3

Spring Semester (16-17 credits)

ADVS 3000 Animal Health and Hygiene	3
ASTE 3050 (CI) Technical and Professional Communication Principles in Agriculture	3
CHEM 1120 (BPS) General Chemistry II	4
SOIL 2000 (BPS) Soils, Waters, and the Environment (3 cr) or	
SOIL 3000 Fundamentals of Soil Science (4 cr)	3 or 4
Breadth Course ¹⁵	3

Junior Year (30 credits)

Fall Semester (14 credits)

ADVS 3500 Principles of Animal Nutrition	3
Depth Course ¹⁶	3
Directed Electives ¹⁷	8

Spring Semester (16 credits)

ADVS 3510 (QI) Applied Animal Nutrition	3
ADVS 4200 (CI) Physiology of Reproduction and Lactation	4
ADVS 4250 Internship in Animal Industry (3 cr) or	
ADVS 4800 Undergraduate Research or Creative Opportunity (3 cr) ..	3
Depth Course ¹⁶	3
Directed Elective	3

Senior Year (30.5 credits)

Fall Semester (15.5 credits)

ADVS 4560 (QI) Principles of Animal Breeding	3
ADVS 4910 Preprofessional Orientation	0.5
ADVS 4920 (CI) Undergraduate Seminar	2
NFS 4900 ST: Dairy Food Processing	4
Directed Elective ¹⁷	3
Free Elective	3

Spring Semester (15 credits)

ADVS 5130 Dairy Cattle Management	3
Directed Electives ¹⁷	9
Free Elective	3

¹⁵Must take one Breadth course from each of the following four categories: Creative Arts, Humanities, Physical Sciences, and Social Sciences. (Note: ECON 1500 fulfills the American Institutions Breadth Course requirement.)

¹⁶Must take one Depth course from each of the following two categories: Humanities and Creative Arts, and Social Sciences.

¹⁷Must take four courses from the following list: ACCT 2010; BA 3400, 3500, 3700; ECON 2010, 3030, 3050, 4010, 4030, 5030; MHR 2990, 3110; and three courses from the following list: ADVS 5030, 5520, 5530; ASTE 3600, 4100; PLSC 4320.

Dairy Science Major

Science Emphasis Curriculum (2.25 GPA)

Freshman Year (31.5-32.5 credits)

Fall Semester (16.5 credits)

ADVS 1110 Introduction to Animal Science	4
ADVS 1910 Orientation to Animal and Dairy Science	0.5
CHEM 1210 Principles of Chemistry I	4
CHEM 1230 Chemical Principles Laboratory I	1
MATH 1050 (QL) College Algebra	4
ENGL 1010 (CL) Introduction to Writing: Academic Prose	3

Spring Semester (15-16 credits)

ADVS 2200 Anatomy and Physiology of Animals	4
CHEM 1220 (BPS) Principles of Chemistry II	4
CHEM 1240 Chemical Principles Laboratory II	1
MATH 1100 (QL) Calculus Techniques (3 cr) or	
MATH 1210 (QL) Calculus I (4 cr)	3 or 4
Breadth Course ¹⁸	3

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Sophomore Year (32 credits)

Fall Semester (15 credits)

ADVS 2130 Dairy Production Practices	3
BIOL 1210 Biology I	4
CHEM 2310 Organic Chemistry I	4
CHEM 2330 Organic Chemistry Laboratory I	1
ENGL 2010 (CL) Intermediate Writing: Research Writing in a Persuasive Mode	3

Spring Semester (17 credits)

ADVS 3000 Animal Health and Hygiene	3
ASTE 3090 Computer Applications in Agriculture	3
BIOL 1220 (BLS) Biology II	4
CHEM 2320 Organic Chemistry II	4
Breadth Course ¹⁸	3

Junior Year (30 credits)

Fall Semester (13 credits)

ADVS 3500 Principles of Animal Nutrition	3
BIOL 3300 General Microbiology	4
STAT 2000 (QI) Statistical Methods	3
Breadth Course ¹⁸	3

Spring Semester (17 credits)

ADVS 3510 (QI) Applied Animal Nutrition	3
ADVS 4200 (CI) Physiology of Reproduction and Lactation	4
BIOL 3200 (QI) Principles of Genetics	4
CHEM 3700 Introductory Biochemistry	3
Breadth Course ¹⁸	3

Senior Year (30.5 credits)

Fall Semester (15.5 credits)

ADVS 4560 (QI) Principles of Animal Breeding	3
ADVS 4910 Preprofessional Orientation	0.5
ADVS 4920 (CI) Undergraduate Seminar	2
Depth Course ¹⁹	3
Electives ²⁰	7

Spring Semester (15 credits)

ADVS 4250 Internship in Animal Industry (3 cr) or	
ADVS 4800 Undergraduate Research or Creative Opportunity (3 cr) ..	3
ADVS 5130 Dairy Cattle Management	3
Depth Course ¹⁹	3
Electives ²⁰	6

¹⁸Must take one Breadth course from each of the following four categories: American Institutions, Creative Arts, Humanities, and Social Sciences.

¹⁹Must take one Depth course from each of the following two categories: Humanities and Creative Arts, and Social Sciences.

²⁰Recommended Electives include ADVS 5160, 5240, 5260; CHEM 3710; PHYX 2110.

Bioveterinary Science Major Requirements (120 credits) (3.0 min. total GPA) (2.5 min. total GPA if including Biotechnology Emphasis)

This is a four-year program, preparing students for application to and admittance to veterinary school or graduate school, or for finding employment in biotechnology research. Courses required for the major may not be taken pass-fail, except for ADVS 3920. In recent years, nearly all students who have been accepted to veterinary school have had at least a 3.5 GPA.

Advanced Standing Requirements

To attain Advanced Standing in Bioveterinary Science, students must have completed or must be currently registered for a minimum of 60 semester credits, and must have earned an overall GPA of at least 2.75 for all credits, including transfer credits, taken up to the time the

petition for Advanced Standing is made. If declaring the Biotechnology Emphasis, students must have earned an overall GPA of at least 2.25.

Students' records will be checked when they reach a total of 60 semester credits. Those who do not meet advanced standing requirements will be notified to meet with their advisor.

Semester Schedule

Freshman Year (30 credits)²¹

Fall Semester (15 credits)

ADVS 1110 Introduction to Animal Science	4
ADVS 1920 Orientation to Bioveterinary Science	1
CHEM 1210 ^{22,23} Principles of Chemistry I	4
CHEM 1230 ²² Chemical Principles Laboratory I	1
MATH 1100 (QL) ^{22,24} Calculus Techniques	3
Electives	2

Spring Semester (15 credits)

ADVS 2200 Anatomy and Physiology of Animals	4
CHEM 1220 (BPS) ²² Principles of Chemistry II	4
CHEM 1240 ²² Chemical Principles Laboratory II	1
ENGL 1010 (CL) ^{22,25} Introduction to Writing: Academic Prose	3
University Studies Breadth Course ^{22,26}	3

Summer Semester

ADVS 3920, Internship in Veterinary Medicine, is recommended. Students may count up to 2 credits of ADVS 3920 as elective upper-division credits toward graduation.

Sophomore Year (30.5 credits)

Fall Semester (15 credits)

BIOL 1210 ²² Biology I	4
CHEM 2310 ²² Organic Chemistry I	4
CHEM 2330 ²² Organic Chemistry Laboratory I	1
University Studies Breadth Course ^{22,26}	3
Electives	3

Spring Semester (15.5 credits)

BIOL 1220 (BLS) ²² Biology II	4
CHEM 2320 ²² Organic Chemistry II	4
ADVS 2920 Orientation to Veterinary Medicine	0.5
BIOL 3200 (QI) ²² Principles of Genetics	4
University Studies Breadth Course ^{22,26}	3

Junior Year (33 credits)

Fall Semester (17 credits)

BIOL 3300 ²² General Microbiology	4
PHYX 2110 ²² The Physics of Living Systems I	4
ENGL 2010 (CL) ²² Intermediate Writing: Research Writing in a Persuasive Mode	3
STAT 1040 (QL) ²² Introduction to Statistics	3
University Studies Breadth Course ^{22,26}	3

Spring Semester (16 credits)

ADVS 3000 Animal Health and Hygiene	3
PHYX 2120 (BPS) The Physics of Living Systems II	4
CHEM 3700 ²² Introductory Biochemistry	3
Two Upper-division University Studies Depth Courses ²⁷	6

Senior Year (at least 29 credits)

Students must complete at least 120 semester credits for the BS degree, of which 40 credits must be in upper-division courses. The student must complete two courses which are communications intensive, and one course which is quantitative intensive. Students must include at least 18 credits from the following list. An additional 7 elective credits are needed to complete the 120 credits required for

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graduation. Other upper-division life sciences courses may be applied to this requirement if approved by a bioveterinary science advisor.

ADVS 3500 Principles of Animal Nutrition (F)	3
ADVS 3510 (QI) Applied Animal Nutrition (Sp)	3
ADVS 4200 (CI) Physiology of Reproduction and Lactation (Sp)	4
ADVS 4560 (QI) Principles of Animal Breeding (F)	3
ADVS 5690 Animal Histology (F)	3
ADVS 5700 (CI) General Animal Pathobiology (Sp)	3
BIOL 5150 Immunology (Sp) (not taught every year)	3
BIOL 5210 Cell Biology (F)	3
BIOL 5230 Developmental Biology (Sp)	3
BIOL 5330 Virology (Sp)	3
BIOL 5600 Comparative Animal Physiology (F)	3
BIOL 5610 (QI) Animal Physiology Laboratory (F,Sp)	2
BIOL 5620 Medical Physiology (Sp)	3

Recommended Courses

The following three courses are highly recommended, but not required:

ADVS 5160 Methods in Biotechnology: Cell Culture (Sp)	3
ADVS 5240 Methods in Biotechnology: Protein Purification Techniques (Sp)	3
ADVS 5260 Methods in Biotechnology: Molecular Cloning (F)	3

Bioveterinary Science Major Biotechnology Emphasis

Semester Schedule

Freshman Year (30 credits)²¹

Fall Semester (14 credits)

ADVS 1110 Introduction to Animal Science	4
ADVS 1920 Orientation to Bioveterinary Science	1
CHEM 1210^{22,23} Principles of Chemistry I	4
CHEM 1230²² Chemical Principles Laboratory I	1
MATH 1100 (QL)^{22,24} Calculus Techniques	3
Elective	1

Spring Semester (16 credits)

ADVS 2040 Introduction to Biotechnology	1
ADVS 2200 Anatomy and Physiology of Animals	4
CHEM 1220 (BPS)^{22,28} Principles of Chemistry II	4
CHEM 1240²² Chemical Principles Laboratory II	1
ENGL 1010 (CL)^{22,25} Introduction to Writing: Academic Prose	3
University Studies Breadth Course ^{22,26}	3

Sophomore Year (32 credits)

Fall Semester (15 credits)

BIOL 1210²² Biology I	4
CHEM 2310²² Organic Chemistry I	4
CHEM 2330²² Organic Chemistry Laboratory I	1
Two University Studies Breadth Courses ^{22,26}	6

Spring Semester (17 credits)

BIOL 1220 (BLS)²² Biology II	4
CHEM 2320²² Organic Chemistry II	4
CHEM 3700²² Introductory Biochemistry	3
ENGL 2010 (CL)²² Intermediate Writing: Research Writing in a Persuasive Mode	3
University Studies Breadth Course ^{22,26}	3

Junior Year (34 credits)

Fall Semester (16 credits)

BIOL 3200 (QI)²² Principles of Genetics	4
BIOL 3300²² General Microbiology	4
ADVS 5260 Methods in Biotechnology: Molecular Cloning	3

STAT 1040 (QL)²² Introduction to Statistics (3 cr) or STAT 2000 (QI) Statistical Methods (3 cr)	3
Electives	2

Spring Semester (18 credits)

ADVS 3200 Ethical Issues in Genetic Engineering and Biotechnology	3
ADVS 5160 Methods in Biotechnology: Cell Culture	3
ADVS 5240 Methods in Biotechnology: Protein Purification Techniques	3
Two Upper-division University Studies Depth Courses ²⁷	6
Elective	3

Senior Year (at least 24 credits)

Summer, Fall, or Spring Semester (12 credits)

ADVS 4260 Internship in Animal Biotechnology Industry	12
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Fall or Spring Semester (12 credits)

During fall or spring semester, students must select 12 credits from the following directed electives:²⁸

ADVS 3000 Animal Health and Hygiene (Sp)	3
ADVS 3500 Principles of Animal Nutrition (F)	3
ADVS 3510 (QI) Applied Animal Nutrition (Sp)	3
ADVS 4200 (CI) Physiology of Reproduction and Lactation (Sp)	4
ADVS 4560 (QI) Principles of Animal Breeding (F)	3
ADVS 5690 Animal Histology (F)	3
ADVS 5700 (CI) General Animal Pathobiology (Sp)	3
ADVS 5820 Animal Cytogenetics and Gene Mapping (F)	3
BIOL 5150 Immunology (Sp) (not taught every year)	3
BIOL 5210 Cell Biology (F)	3
BIOL 5230 Developmental Biology (Sp)	3
PHYX 2110²⁸ The Physics of Living Systems I (F)	4
PHYX 2120 (BPS) The Physics of Living Systems II (Sp)	4

²¹If a student is unable to pass the Computer and Information Literacy (CIL) Test, USU 1000 and BIS 1400 should be taken the first year.

²²Required for Colorado, Washington, and Oregon veterinary schools.

²³Students with little exposure to chemistry or an ACT Math score less than 25 will need to begin with a lower-level chemistry class and/or take MATH 1050 first. (See an advisor for assistance.)

²⁴Students with math ACT scores of less than 25 must start with a lower-level class.

²⁵Can also be met by an AP English Language and Composition or Literature and Composition test score of 3 or higher, an ACT English test score of 29 or higher, a CLEP English Composition test score of 50 or higher, a CLEP Freshman College Composition test score of 53 or higher, or an SAT Verbal test score of 640 or higher.

²⁶Must take one Breadth course from each of the following four categories: Humanities, Creative Arts, Social Sciences, and American Institutions. Two of these courses must be taken with a USU prefix. AP or CLEP tests may be used to fulfill some Breadth requirements.

²⁷Two approved Depth courses are required: one in Humanities and Creative Arts and one in Social Sciences (3000 level or higher). It is recommended that one of these courses be a Communications Intensive (CI) course.

²⁸PHYX 2110 must be taken if the student plans to apply to veterinary school in Colorado, Washington, or Oregon.

Bioveterinary Science: Preveternary

This curriculum includes those courses required for application to WICHE veterinary schools after three years of study. Requirements are as follows. Courses followed by an asterisk (*) may be waived with permission of a bioveterinary science advisor.

Freshman year

ADVS 1110 Introduction to Animal Science (F,Sp)	4
ADVS 1920* Orientation to Bioveterinary Science (F)	1
ADVS 2200 Anatomy and Physiology of Animals (Sp)	4
CHEM 1210 Principles of Chemistry I (F,Sp)	4
CHEM 1220 (BPS) Principles of Chemistry II (F,Sp,Su)	4
CHEM 1230 Chemical Principles Laboratory I (F,Sp)	1
CHEM 1240 Chemical Principles Laboratory II (F,Sp)	1
ENGL 1010 (CL) Introduction to Writing: Academic Prose (F,Sp,Su) ...	3
MATH 1100 (QL) Calculus Techniques (F,Sp,Su)	3
One University Studies Breadth course	3

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Sophomore year

ADVS 2920* Orientation to Veterinary Medicine (Sp)	0.5
BIOL 1210 Biology I (F)	4
BIOL 1220 (BLS) Biology II (Sp)	4
BIOL 3200 (QI) Principles of Genetics (F,Sp,Su)	4
CHEM 2310 Organic Chemistry I (F)	4
CHEM 2320 Organic Chemistry II (Sp)	4
CHEM 2330 Organic Chemistry Laboratory I (F,Sp)	1
Two University Studies Breadth courses	6
Electives	variable

Junior year

ADVS 3000 Animal Health and Hygiene (Sp)	3
BIOL 3300 General Microbiology (F,Sp)	4
CHEM 3700 Introductory Biochemistry (Sp)	3
ENGL 2010 (CL) Intermediate Writing: Research Writing in a Persuasive Mode (F,Sp,Su)	3
PHYX 2110 The Physics of Living Systems I	4
PHYX 2120 (BPS) The Physics of Living Systems II	4
STAT 1040 (QL) Introduction to Statistics (F,Sp,Su)	3
One University Studies Breadth course	3
Two University Studies Depth courses	6
Electives	variable

Senior year

Choose from among the following courses to complete the University requirements for the bachelor's degree:

ADVS 3500 Principles of Animal Nutrition (F)	3
ADVS 3510 (QI) Applied Animal Nutrition (Sp)	3
ADVS 4200 (CI) Physiology of Reproduction and Lactation (Sp)	4
ADVS 4560 (QI) Principles of Animal Breeding (F)	3
ADVS 5690 Animal Histology (F)	3
ADVS 5700 (CI) General Animal Pathobiology (Sp)	3
BIOL 5150 Immunology (Sp) (not taught every year)	3
BIOL 5210 Cell Biology (F)	3
BIOL 5230 Developmental Biology (Sp)	3
BIOL 5330 Virology (Sp)	3
BIOL 5600 Comparative Animal Physiology (F)	3
BIOL 5610 (QI) Animal Physiology Laboratory (F,Sp)	2
BIOL 5620 Medical Physiology (Sp)	3
Other upper-division life sciences courses approved by a bioveterinary science advisor	variable

Dairy Herdsman Program

The Program

The Dairy Herdsman Program is a one-year course of study in practical dairy knowledge and skills. Through lectures, laboratory exercises, and actual on-the-farm experiences, students are taught to be dairy herdsman, with highly employable skills. A high school education is highly recommended, but is not a requirement to be admitted to the program.

The classroom and laboratory experiences are directed by Utah State University staff members, extension personnel, and specially qualified guest speakers. Coursework covers such areas as nutrition and feeding, management, physiology, milk production, breeding and selection, and buildings and equipment. Students also gain practical experience and know-how by working with a commercial dairyman in Cache Valley. Many students are now selecting the new degree option, which allows students to take the dairy herdsman classwork and then continue on for a degree in dairy science.

All students may participate in judging at regional and national levels, showing at state and area shows, working with area sales, and

field trips to the Western International Dairy Expo, the Dairy Herd Improvement Laboratory, and progressive dairy enterprises. These activities provide a well-rounded background and improve employment opportunities.

Students in this program have access to all privileges available to Utah State University students: athletic and entertainment events, campus housing and food services, the University library, the bookstore, and recreational facilities.

Career Opportunities

Students who complete this program will have a good working knowledge of how to care for and make decisions about various dairy animals and will understand and be able to use various types of equipment. These skills, as well as an understanding of the management process involved, can greatly improve the chances of being employed by a dairy or dairy-related industry.

Required Coursework for Dairy Herdsman Program

Fall Semester (16 credits)

ADVS 1010 Artificial Insemination and Reproduction	2
ADVS 1020 Dairy Cattle Nutrition and Feeding	3
ADVS 1050 Dairy Genetics	3
ADVS 1250 Applied Agricultural Computations	2
ADVS 2130 Dairy Production Practices	3
ADVS 2250 Cooperative Work Experience	3

Spring Semester (16 credits)

ADVS 1030 Lactation and Milking Systems	3
ADVS 1040 Records and Financial Aspects of Dairy Herd Operations	3
ADVS 1060 Applied Feeding and Management of Dairy Calves and Basic Construction of Facilities	3
ADVS 1720 Dairy Cattle Evaluation and Judging	1
ADVS 2250 Cooperative Work Experience	6

BA Degree in Animal/Dairy/ Bioveterinary Science

Students must complete requirements for the BS degree in these respective programs (see above), plus two years of a foreign language (see page 55 of this catalog).

Honors

There is also an Honors Plan for students desiring a BA or BS degree "with Honors" in Animal/Dairy/Bioveterinary Science. For details, students should contact their academic advisor.

ADVS Minors

A minor can be valuable when associated with a major in agricultural education, agricultural economics, plant science, nutrition and food science, business, economics, computer science, rangeland resources, and in other disciplines where the animal industry has direct or indirect involvement.

Requirements for specialty or emphasis area minors are listed below. The same departmental standards applying to animal science and dairy science majors also apply to all minors (see page 136).

Requirements for Minors

The following is a listing of courses for the various minor emphasis areas. A specific course may not be used to fulfill the requirements of more than one ADVS minor.

Department of Animal, Dairy and Veterinary Sciences

General Animal Science

ADVS 1110; choose one or more courses from ADVS 2080, 2090, 2120, 2190; 10 elective ADVS credits with approval of an animal science advisor.

General Dairy Science

ADVS 1110, 2130; 10 elective ADVS credits with approval of a dairy science advisor.

Biovetterinary Science

ADVS 2200, 3000, 4200; 3 elective ADVS credits with approval of a biovetterinary science advisor.

Horse Production

ADVS 1110, 2190, 2250; 6 or more elective ADVS credits with approval of an animal science advisor.

Horse Training

ADVS 1110, 1600, 2190, 2600; 2 or more elective ADVS credits with approval of an animal science advisor.

Dairy Herdsman

ADVS 1020, 1030, 1040, 1050, 1060. (*Not available to Dairy Science Majors.*)

Transfer students must have a minimum of one 3-credit upper-division course in residency with the approval of an ADVS advisor.

Undergraduate Program Assessment

The ADVS Department assessment plan defines learning objectives for each of its undergraduate programs. These learning objectives are mapped to each of the required courses in each program, so that they may be evaluated for their contribution to program goals. Outcome measures have also been defined for each program, and a process has been implemented to conduct exit interviews with all graduating students in Animal and Dairy Science. Rate of admission to a professional veterinary medical program has been identified as the critical outcome measure for the Biovetterinary Science program. The ADVS Department Curriculum Committee oversees the assessment process, with input from the ADVS Department Internship and Placement Committee. The ADVS Curriculum Committee reports its assessment findings to the ADVS department head, as well as to faculty members, and incorporates these findings in its regular ongoing and periodic comprehensive reviews and revisions of the ADVS Department undergraduate programs.

Learning Objectives

Animal Science Major (Animal Industries Emphasis)

The following *Disciplinary Knowledge* objectives apply:

1. Attain knowledge in mathematics and basic sciences required for disciplinary competency.
2. Know the nature, intent, and scope of animal science.
3. Attain depth in two subfields of animal science.
4. Achieve understanding in the disciplines of animal genetics, health, nutrition, and reproduction.
5. Integrate knowledge from the various disciplines to effectively conduct livestock operations.

Skills and Career Competencies objectives are as follows:

1. Comprehend reading materials appropriate to course levels.
2. Communicate effectively in oral and written forms.
3. Conduct library research using modern methods.
4. Use a computer for written work, presentations, and research.
5. Attain proficiency in basic techniques of animal management.

Animal Science and Dairy Science Majors (Science Emphasis)

The following *Disciplinary Knowledge* objectives apply:

1. Attain knowledge in mathematics and basic sciences required for disciplinary competency.
2. Know the nature, intent, and scope of animal/dairy science.
3. Attain depth in one subfield of animal/dairy science.
4. Achieve understanding in the disciplines of animal genetics, health, nutrition, and reproduction.
5. Effectively integrate knowledge from basic sciences to applications in the animal sciences.

Skills and Career Competencies objectives are as follows:

1. Comprehend reading materials appropriate to course levels.
2. Communicate effectively in oral and written forms.
3. Conduct library research using modern methods.
4. Use a computer for written work, presentations, and research.

Animal Science and Biovetterinary Science Majors (Biotechnology Emphasis)

The following *Disciplinary Knowledge* objectives apply:

1. Attain a working knowledge of biological mechanisms, including genetics, reproduction, and microbiology.
2. Acquire a working knowledge of mathematics, including calculus and statistics.
3. Achieve a working knowledge of chemistry, including inorganic, organic, and biochemistry.
4. Attain a basic knowledge of animal biotechnology and ethics.

Skills and Career Competencies objectives are as follows:

1. Understand and perform molecular cloning.
2. Understand and perform cell culture procedures.
3. Understand and perform protein purification.
4. Communicate effectively in oral and written forms.
5. Achieve quantitative competency.
6. Conduct scientific-literature searches using modern methods.

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Bioveterinary Science Major

The following *Disciplinary Knowledge* objectives apply:

1. Attain a working knowledge of biological mechanisms, including molecular genetics.
2. Acquire a working knowledge of mathematics, including calculus and statistics.
3. Achieve a working knowledge of chemistry, including inorganic, organic, and biochemistry.
4. Acquire a basic knowledge of general physics.
5. Attain a basic knowledge of animal production, including breeding, nutrition, and reproduction.
6. Achieve a basic understanding of health and disease mechanisms.
7. Understand the ethics and profession of veterinary medicine.

Skills and Career Competencies objectives are as follows:

1. Communicate effectively in oral and written forms.
2. Achieve quantitative competency.
3. Conduct scientific literature searches using modern methods.

Dairy Science Major (Dairy Industries Emphasis)

The following *Disciplinary Knowledge* objectives apply:

1. Attain knowledge in mathematics and basic sciences required for disciplinary competency.
2. Know the nature, intent, and scope of dairy science.
3. Achieve understanding in the disciplines of animal genetics, health, nutrition, reproduction, and lactation.
4. Integrate knowledge from the various disciplines to effectively conduct dairy operations.

Skills and Career Competencies objectives are as follows:

1. Comprehend reading materials appropriate to course levels.
2. Communicate effectively in oral and written forms.
3. Conduct library research using modern methods.
4. Use a computer for written work, presentations, and research.
5. Attain proficiency in basic techniques of animal management.

Undergraduate Research Opportunities

Students interested in pursuing undergraduate research opportunities in the ADVS Department should contact Jeffrey L. Walters, Agricultural Science 246, jeffrey.walters@usu.edu, (435) 797-2161, for information and referrals.

Departmental Honors

Students who would like to experience greater academic depth within their major are encouraged to enroll in departmental honors. Through original, independent work, Honors students enjoy the benefits of close supervision and mentoring, as they work one-on-one with faculty in select upper-division departmental courses. Honors students also complete a senior project, which provides another opportunity to collaborate with faculty on a problem that is significant, both personally and in the student's discipline. Participating in departmental honors enhances students' chances for obtaining fellowships and admission to graduate school.

ADVS students qualify for acceptance into the departmental honors program by having a cumulative GPA of 3.3 or better at the time of application. The program of study requires the completion of 15 credits of upper-division (3000-level or above) classwork as follows: One credit of HONR 4800H, Thesis/Project Seminar; 3 to 6 credits of HONR 4900H, Senior Thesis/Project; and 8 to 11 credits of upper-division Honors coursework by contract (3 credits may be taken outside the ADVS Department). Completion of the degree requires a cumulative GPA of 3.3 and a 3.5 GPA in upper-division Honors classes. Examples of departmental classes which may be suitable as Honors courses by contract are ADVS 3000, 3200, 3500, 3510, 4200, 4560, 5160, 5240, 5260, 5350, 5400, 5520, 5530, 5690, 5700, and 5820. Students should plan their Honors Program early, so that their thesis project can be completed during the first semester of their senior year, and their last semester can be used to write and present their thesis.

Interested students should contact the Honors Program, Merrill Library 374, (435) 797-2715, honors@cc.usu.edu. Additional information can be found online at: <http://www.usu.edu/honors/>

Additional Information and Updates

For more information about Bachelor of Science requirements and the sequence in which courses should be taken, see major requirement sheets. For more information on ADVS Department minors, see minor requirement sheet. These are available from the ADVS Department advisor's office (AG S 242). Major requirement sheets can also be found online at: <http://www.usu.edu/ats/majorsheets/>

Successful completion of a bachelor's degree program in the ADVS Department requires that a very close student-academic advisor relationship be established and continued through each student's bachelor's degree program. Each student must take the responsibility of establishing this close working relationship with his or her advisor. Doing this soon after the student's entry into the department can keep academic problems to a minimum.

For updated information on ADVS programs and course offerings, check the departmental home page at: <http://www.advs.usu.edu>

Safety and Liability in Classes and Laboratories

Certain classes and laboratories involve a risk of bodily injury or of damage to clothing. Students should take appropriate precautions and wear suitable protective clothing. Some of the risks include handling or being near animals, slick floors or corrals, use of toxic or corrosive substances, and the use of sharp or breakable instruments and equipment. Students should take precautions to avoid fainting during demonstrations or work with animal tissues or operative procedures. Students must assume their own liability protection for travel to and

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from classes, laboratories, and field trips. The University and its employees assume no liability in the performance of classroom or laboratory instruction or on scheduled field trips, or for other dangerous activities. The student, by voluntarily participating in these classes and activities, agrees to assume the risk and not hold USU or its staff liable.

Financial Support

In addition to the scholarships and other financial aid available through the University, the department awards designated scholarships to qualified students. The department employs students on a part-time basis to assist with its research and operate its animal facilities. The department also coordinates cooperative education and internship employment opportunities for students. For more information, contact the department.

Graduate Programs

Admission Requirements

In addition to the general admission requirements (see pages 93-94), applicants should have satisfactory (3.0 GPA or better) grades in completion of previous degree programs. GRE exam, verbal, quantitative, and analytical scores at or above the 40th percentile are required.

The applicant for a graduate program in animal or dairy science should have completed a BS undergraduate program similar to the USU animal science or dairy science Science Emphasis BS degree. This background would include the following courses and their prerequisites: BIOL 1210 and 1220 or their equivalents; CHEM 2310 and 2320 or their equivalents; MATH 1050 and STAT 1040 or their equivalents. Applicants with deficiencies in these areas may be admitted to the graduate program subject to the completion of remedial coursework specified by the department. Other preparatory courses may be specified by the student's supervisory committee.

Applicants to the bioveterinary science graduate program should have a degree in bioveterinary science, biology, microbiology, chemistry, or one of the animal sciences. Pre-veterinary students oriented towards graduate research studies are strongly encouraged to apply.

Degree Programs

Master of Science

The MS is available to qualified students with bachelor's degrees. MS degrees are offered by the department in animal science and dairy science, with five specializations in each, and in bioveterinary science.

Doctor of Philosophy

The PhD degree in animal science is offered with four specializations. It is available to qualified students with master's degrees in related disciplines. Exceptionally well-qualified applicants may be considered for admission to a postbaccalaureate PhD program. The PhD degree in bioveterinary science has three specializations and is available to qualified students holding a DVM or a master's degree in a related discipline, or exceptionally well-qualified postbaccalaureate applicants. The PhD is a terminal research degree that is awarded upon successful completion of a comprehensive program of coursework and original research in an approved area of specialization.

Specializations in Animal/Dairy Science

Animal Nutrition

This specialization involves studies in biochemistry, principles of nutrition, animal management, nutritional physiology, and animal feedstuffs. Cooperation with producers, feed industry groups, other departments of the University, and USDA collaborators, along with research funding from private industry, strengthens the graduate program in this area.

Course requirements: Students in the MS program are required to complete the following courses: ADVS 6800, any four ADVS graduate nutrition courses at the discretion of the supervisory committee; one 5000-level Statistics course. Students in the MS program are required to complete or to have completed CHEM 3700 or its equivalent, but will not receive graduate credit for it. Students in the PhD program are required to meet or have met all MS program requirements, as well as to complete the following coursework: ADVS 6800 (additional to the MS requirement), ADVS graduate nutrition courses as directed by the supervisory committee; CHEM 5700, 5710; one 5000-level Statistics course (additional to the MS requirement); additional coursework at the discretion of the supervisory committee to a total of at least 30 credits.

Breeding and Genetics

This specialization involves studies in quantitative genetics, applied animal genetics, statistics, and animal management. Cooperation with other departments, particularly the Department of Biology and the Department of Mathematics and Statistics, and collaboration with other research institutions, livestock producers, and commercial animal breeding companies broadens the resources of this graduate program.

Course requirements: Students in the MS program are required to complete the following courses: ADVS 6300, 6800; BIOL 6170, 6280; STAT 5110; and a minimum of 6 credits in the student's area of study. Students in the PhD program are required to complete the following courses in addition to those required for the MS degree: ADVS 6800, 6820; MATH 5710, 5720; STAT 6710, 6720.

Molecular Biology

This specialization involves studies in molecular genetics, biochemistry of nucleic acids, cell biology, reproductive physiology, and bioveterinary science. Cooperation with other departments, particularly the Department of Biology and the Department of Chemistry and Biochemistry, the Biotechnology Center, and collaborators at other research institutions allows for a strong graduate program in this area.

Course requirements: Students in the MS program are required to complete the following courses: ADVS 5160 or 5240 or 5260; ADVS 6800; BIOL 4200 or 6210; BIOL 5190; STAT 5200; and a minimum of 6 credits in the student's area of study. Students in the PhD program are required to complete the following courses in addition to those required for the MS degree: ADVS 6800; CHEM 5700, 5710.

Reproductive Biology

This specialization involves studies in physiology and endocrinology of reproduction; embryo technology, including collection, culture, manipulation, storage, and transfer of embryos; disease transmission, cytogenetics and molecular genetics; and environmental and toxicological influences on reproductive processes and fetal development. Cooperation with other departments and research centers of the University and with USDA collaborators allows for a strong graduate program in this area.

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Course requirements: Students in the MS program are required to complete the following courses: ADVS 6200, 6800; BIOL 4200; STAT 5200. Students in the PhD program are required to complete the following coursework additional to the MS requirements: ADVS 6800; BIOL 5150, 6210; CHEM 5700, 5710. Additional coursework for the MS and PhD degree may be required at the discretion of the supervisory committee.

Animal or Dairy Management (MS only)

This specialization involves studies in the applications of the principles of genetics, reproductive biology, and nutrition to animal or dairy management at an advanced level. Appropriate emphasis is also placed on statistics, economics and business administration, and range management. The management specialization offers the option of degree programs with or without thesis (Plan A or Plan B). Graduates in management from a program including thesis (Plan A) may pursue advanced studies in more specialized fields. The MS in management without a thesis (Plan B) is considered a terminal degree.

Course requirements: Students choosing either the option with thesis (Plan A) or the option without thesis (Plan B) are required to complete the following courses: ADVS 6200, 6300, 6520 or 6530, 6800; plus one of the following (if comparable course not previously completed at the undergraduate level): ADVS 6080, 6090, 6120, 6130, 6190; one 5000-level Statistics course. Additional courses in related areas will be required as directed by the supervisory committee.

Bioveterinary Science

This degree program involves studies in biochemistry, statistics, pathology, toxicology, virology, parasitology, pharmacology, microbiology, and laboratory animal management. Advanced techniques in laboratory procedures and animal health research are emphasized. Cooperation with other departments and research centers of the University and with federal collaborators and agencies allows for a strong graduate program in bioveterinary science.

Course requirements: Students in the MS program are required to complete the following courses: ADVS 6700, 6800; CHEM 5700; STAT 3000. Students in the PhD program are required to complete the following courses: ADVS 6700, 6800; CHEM 5700, 5710; STAT 5200. Additional coursework will be determined by the supervisory committee.

Research

The ADVS department conducts a broad range of basic and applied research in the areas of animal reproduction, animal nutrition, livestock and dairy management, animal health, virology, parasitology, toxicology, animal behavior, cytogenetics, and molecular genetics. Department facilities include over 30 research laboratories on campus and at local and regional animal research facilities. There are research herds and flocks of beef and dairy cattle, sheep, and swine housed close to the University. There are additional research units housing beef cattle, sheep, and turkeys located throughout the state. Research in the department is funded by a multimillion dollar budget derived from support by the Utah Agricultural Experiment Station and by substantial outside contracts and grants. Cooperation with other departments and research centers of the University and with federal collaborators enhances the ADVS research and graduate programs. Significant in this regard are the University Center for Integrated BioSystems, the Utah State Animal Disease Diagnostic Laboratories, the Laboratory Animal Research Center, the Center for Environmental Toxicology, the Center for the Genetic Improvement of Livestock, and the on-campus USDA Poisonous Plant Laboratory.

Financial Assistance

Both departmental and research grant support are available to matriculated graduate students on a competitive basis. The department funds a number of graduate assistantships, which are available on a competitive basis to matriculated graduate students who are U.S. citizens, nationals, or residents. Students interested in departmental assistantships may request an application form from the department. Applications for assistantships for the following academic year must be submitted by March 15.

Acceptance to graduate study in the ADVS Department does not constitute a guarantee of financial assistance.

Career Opportunities

Career opportunities are available for students who have earned graduate degrees in the MS and PhD programs offered by the ADVS Department as described below.

Animal and Dairy Science Graduate Degree Programs

Animal Nutrition

Career opportunities exist in extension, university and private research, the commercial animal feedstuffs industry, private consulting firms, and international programs.

Breeding and Genetics

Career opportunities exist in extension university and private research, commercial animal breeding and genetic engineering enterprises, and international programs.

Molecular Biology

Career opportunities exist in university, federal, and private research organizations, and in commercial applications in the rapidly growing area of biotechnology.

Reproductive Biology

Career opportunities exist in extension; university and private research; the pharmaceutical, embryo transfer, and artificial insemination industries; private consultation; and international programs.

Animal or Dairy Management

Career opportunities include extension, private consultation firms, farm and ranch management, sales and service to agricultural producers, agricultural finance, and international programs.

Biovetterinary Science Graduate Degree Programs

Career opportunities in this area exist in research, management, and submanagement positions in public and private health research and testing organizations, and in commercial industries in the health field. Graduates from the MS program may seek admission to advanced degree programs in the biological sciences or veterinary medicine.

Animal, Dairy and Veterinary Sciences Faculty

Trustee Professor

Robert W. Sidwell, virology

Department of Animal, Dairy and Veterinary Sciences

Professors

Stanley D. Allen, veterinary medicine, laboratory animal management
Clell V. Bagley, veterinary medicine
Thomas D. Bunch, cytogenetics, embryo biology
Noelle E. Cockett, molecular genetics, identification of genetic markers
Roger A. Coulombe, Jr., veterinary toxicology, molecular biology
Howard M. Deer, pesticides, environmental toxicology
Mark C. Healey, parasitology
Lyle G. McNeal, sheep production, wool science
Kenneth L. White, reproductive physiology, developmental biology

Research Professors

John D. Morrey, virology, transgenic animals
Kamal A. Rashid, in vitro mutagenesis and DNA repair
Donald F. Smee, viral chemotherapy

Adjunct Professors

J. Talmage Huber, dairy nutrition
Lynn F. James, animal physiology
Amrit K. Judd, medicinal chemistry as applied to treatment of viral diseases
Michael R. Marshall, veterinary medicine
Kanok Pavasuthipaisit, medical science, anatomy
R. Dean Plowman, dairy genetics, management
Rex S. Spendlove, microbiology

Professors Emeriti

Clive W. Arave, behavior, dairy genetics
John E. Butcher, ruminant nutrition
Jay W. Call, veterinary medicine
Warren C. Foote, reproductive physiology
James LeGrande Shupe, veterinary science, comparative clinical medicine
Ross A. Smart, veterinary diagnostic pathology
Norris J. Stenquist, livestock production, nutrition
Wallace R. Taylor, dairy breeding, dairy herd improvement
Don W. Thomas, veterinary medicine

Associate Professors

Thomas J. Baldwin, veterinary diagnostic pathology
Tilak R. Dhiman, dairy nutrition
David D. Frame, poultry production and management
Jeffery O. Hall, veterinary pathology, toxicology
Kenneth C. Olson, range livestock nutrition, management
Lee S. Rickords, molecular genetics, developmental biology
Randall D. Wiedmeier, beef cattle nutrition, management
Allen J. Young, dairy management, reproduction
Dale R. ZoBell, beef cattle production, management

Adjunct Associate Professors

Dale R. Gardner, chemistry/toxicology
Kip E. Panter, animal science/toxicology
Roy W. Silcox, physiology, nutrition
Bryan L. Stegelmeier, pathology
John T. Stellflug, reproductive physiology, biochemistry, statistics
J. Christopher Wilson, veterinary medicine, fisheries

Associate Professor Emeritus

Larry M. Slade, equine nutrition, management

Research Associate Professors

Dale L. Barnard, virology
Ronald L. Boman, dairy nutrition, management

Adjunct Research Associate Professor

Shiquan Wang, cytogenetics, reproductive physiology

Assistant Professors

Ramona T. Skirpstunas, bacterial diseases of fish, veterinary pathology, veterinary laboratory diagnostic medicine
Quinton A. Winger, reproductive physiology, molecular biology

Adjunct Assistant Professors

Breck D. Hunsaker, veterinary immunology
Stephen T. Lee, analytical chemistry
Timothy A. McAllister, ruminant nutrition, microbiology

Research Assistant Professors

Brian B. Gowen, immunology, virology
Jeffrey L. Walters, dairy cattle breeding, statistics

Clinical Assistant Professor

Douglas S. Hammon, clinical veterinarian, dairy reproduction, nutrition

Research Assistant Professor Emeritus

Robert E. Warnick, turkey nutrition

Lecturers

Brett R. Bowman, animal science/nutrition
Parl Galloway, animal science, manager of Animal Science Farm
Justin A. Jenson, dairy herdsman coordinator, dairy youth specialist
Annemarie McAsey, equitation

Course Descriptions

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Department of Aquatic, Watershed, and Earth Resources

Department Head: Chris Luecke
Location: Natural Resources 210
Phone: (435) 797-2459
FAX: (435) 797-1871
E-mail: chris.luecke@usu.edu
WWW: <http://www.cnr.usu.edu/awer>

Undergraduate Advisor: Maureen A. Wagner, Natural Resources
120, (435) 797-2448, maureen@cc.usu.edu

Degrees offered: Bachelor of Science (BS) in Fisheries and Aquatic Sciences; BS in Watershed and Earth Systems; Master of Science (MS) and Doctor of Philosophy (PhD) in Watershed Science; MS and PhD in Ecology; MS and PhD in Fisheries Biology

Graduate specializations: *MS, PhD in Ecology*—Aquatic Ecology; *MS, PhD in Fisheries Biology*—Aquatic Ecology, Conservation Biology, Fisheries Management

Undergraduate Programs

Objectives

The Department of Aquatic, Watershed, and Earth Resources (AWER) offers comprehensive educational opportunities for graduate and undergraduate students in hydrology, geomorphology, biogeochemistry, water quality, watershed management, fisheries, aquatic ecology, remote sensing, and geographic modeling. Departmental faculty provide expertise in fisheries, the hydrologic cycle, conservation biology, restoration and management of aquatic and riparian ecosystems, and in the remote sensing and geographic analysis of the earth's landcovers. Graduates of departmental programs become scientists and managers for natural resource agencies, professionals with consulting and nonprofit environmental firms, and teachers and researchers at major universities.

Career Opportunities

Graduates in Aquatic, Watershed, and Earth Resources occupy an expanding niche in the fields of natural resources and environmental management. Degree holders often work as environmental scientists, hydrologists, fisheries biologists, or specialists in geographic information analysis and remote sensing. With experience and/or advanced degrees, AWER graduates may do natural resource assessment, management planning, and resource impact analysis.

Federal agencies, such as the Forest Service, Fish and Wildlife Service, Geological Survey, Bureau of Land Management, Environmental Protection Agency, National Park Service, Bureau of Reclamation, and National Marine Fisheries Service, hire graduates of AWER academic programs. Graduates also find employment with state natural resource agencies, nongovernmental conservation organizations, and private consulting firms.

Requirements

Departmental Admission Requirements

Admission requirements for the department are the same as those described for the College of Natural Resources (see pages 117-118).

Graduation Requirements

All courses listed as major subject courses must be taken on an A-B-C-D-F basis. A grade of C- or better is required for all AWER courses

used to meet the requirements for a major or minor in the department. The grade point average for all courses taught by the College of Natural Resources must be 2.5 or higher.

For information about changes in requirements, course sequence, and scheduling, students should confer with a departmental advisor. The undergraduate program can be readily tailored to individual student needs with the help of a faculty advisor.

In addition to completing the University Studies course requirements, all students earning an undergraduate degree in the Department of Aquatic, Watershed, and Earth Resources must complete the Common Departmental Core and Capstone Course, as listed below. Some of these courses may be used toward the University Studies requirements, as indicated by the University Studies designations listed in parentheses following the course numbers.

A. Common Departmental Core (19 credits)

AWER 1020 Aquatic, Watershed, and Earth Resources Professional Orientation (F).....	1
AWER 3700 (CI) Fundamentals of Watershed Science (Sp).....	3
AWER 4490 Small Watershed Hydrology (F).....	4
AWER 4500 Freshwater Ecology (Sp).....	3
AWER 4930 Geographic Information Systems (F).....	4
AWER 4980 Undergraduate Seminar (F,Sp).....	1
ENVS 5320 Water Law and Policy in the United States (F).....	3

B. Capstone Course (3 credits minimum)

AWER 4510 Aquatic Ecology Practicum (F).....	3
AWER 4530 Water Quality and Pollution (Sp).....	3
AWER 4950 ST: Watershed Analysis (Sp).....	3
AWER 5330 Large River Management (F).....	3
AWER 5930 Geographic Information Analysis (Sp).....	4
OR	
Approved Natural Resources Capstone Experience.....	3

Bachelor of Science in Fisheries and Aquatic Sciences

Students in the Fisheries and Aquatic Sciences major must meet the course requirements for University Studies, as well as complete the Common Departmental Core and Capstone Course listed above. They must also complete 51 credits of Science Foundation and Fisheries Courses, plus 23 credits of Directed Electives, as listed below.

The first two years of study include courses designed to give the student a sound scientific background, an introduction to the field of natural resources management, and an introduction to aquatic and earth resources.

A. Scientific Foundation (35 credits)

BIOL 1210 Biology I (F).....	4
BIOL 1220 (BLS) Biology II (Sp).....	4
CHEM 1210 Principles of Chemistry I (F,Sp).....	4
CHEM 1230 Chemical Principles Laboratory I (F,Sp).....	1
CHEM 1220 (BPS) Principles of Chemistry II (F,Sp,Su).....	4
CHEM 1240 Chemical Principles Laboratory II (F,Sp).....	1
MATH 1050 (QL) College Algebra (F,Sp,Su).....	4
MATH 1100 (QL) Calculus Techniques (F,Sp,Su).....	3
NR 2220 General Ecology (F,Sp).....	3
PHYX 2110 The Physics of Living Systems I.....	4
STAT 3000 (QI) Statistics for Scientists (F,Sp).....	3

B. Fisheries Courses (16 credits)

AWER 3100 (DSC/CI) Fish Diversity and Conservation (F).....	3
AWER 3110 Fish Diversity Laboratory (F).....	1
AWER 4510 Aquatic Ecology Practicum (F).....	3

Department of Aquatic, Watershed, and Earth Resources

AWER 4650 Principles in Fishery Management (Sp).....	3
AWER 5200 Fish Habitat Relationships in Managed Forests (F)	3
AWER 5550 Freshwater Invertebrates (Sp).....	3

C. Directed Electives

Students must choose a minimum of 23 elective credits to complete the Fisheries and Aquatic Sciences degree requirements. The majority of these elective credits must come from courses directly related to the degree program. **All elective courses must be approved by the student's faculty advisor before enrollment.** The following is a list of recommended courses that could be used to satisfy this requirement.

AWER 3000 Oceanography (Sp)	3
AWER 3820 (QI) Climate Change (Sp).....	3
AWER 4530 Water Quality and Pollution (Sp)	3
AWER 5150 Fluvial Geomorphology (F)	3
AWER 5640 Riparian Ecology and Management (Sp).....	3
ENVS 4000 (DSS) Human Dimensions of Natural Resource Management (F)	3
FRWS 4880 Genetics in Conservation and Management (F)	3
HIST 3950 (DHA/CI) Environmental History (Sp)	3
PHIL 3510 (DHA) Environmental Ethics (F,Sp).....	3
POLS 4820 (DSS) Natural Resources and Environmental Policy: Political Economy of Environmental Quality (Sp)	3

Note: Students wanting to pursue federal employment should check the following U.S. Office of Personnel Management website for a listing of required coursework:

<http://www.opm.gov/qualifications/SEC-IV/B/GS0400/0482.HTM>

D. General Electives

Students may take the remainder of the 120 credits from any department. The guidelines described under *General Education Requirements* and *University Studies Depth Education Requirements* (see pages 46-54) should be consulted to ensure meeting University Studies Requirements.

Fisheries and Aquatic Sciences Major Recommended Four-Year Plan of Study

Students should meet regularly with their faculty advisor and carefully plan their academic program, keeping in mind that many upper-division courses have prerequisites and must be taken in sequence. Students following the recommended schedule listed below should be able to complete degree requirements in four years (eight semesters).

Freshman Year (29 credits)

Fall Semester (15 credits)

AWER 1020 Aquatic, Watershed, and Earth Resources Professional Orientation	1
BIOL 1210 Biology I	4
ENGL 1010 (CL) Introduction to Writing: Academic Prose	3
MATH 1050 (QL) College Algebra.....	4
Breadth American Institutions (BAI) Course	3

Spring Semester (14 credits)

AWER 4980 Undergraduate Seminar	1
BIOL 1220 (BLS) Biology II.....	4
MATH 1100 (QL) Calculus Techniques	3
Breadth Creative Arts (BCA) Course	3
Breadth Humanities (BHU) Course	3

Sophomore Year (29 credits)

Fall Semester (15 credits)

AWER 3100 (CI) Fish Diversity and Conservation	3
AWER 3110 Fish Diversity Laboratory	1
CHEM 1210 Principles of Chemistry I	4

CHEM 1230 Chemical Principles Laboratory I	1
ECON 1550 (BSS) Introduction to Environmental and Natural Resource Economics (3 cr) or	
Other approved Breadth Social Sciences Course (3 cr)	3
ENGL 2010 (CL) Intermediate Writing: Research Writing in a Persuasive Mode	3

Spring Semester (14 credits)

AWER 3700 (CI) Fundamentals of Watershed Science	3
CHEM 1220 (BPS) Principles of Chemistry II	4
CHEM 1240 Chemical Principles Laboratory II	1
NR 2220 General Ecology	3
STAT 3000 (QI) Statistics for Scientists	3

Junior Year (33 credits)

Fall Semester (18 credits)

AWER 4490 Small Watershed Hydrology	4
AWER 4930 Geographic Information Systems	4
ENVS 4000 (DSS) Human Dimensions of Natural Resource Management (3 cr) or	
Other approved Depth Social Sciences (DSS) Course (3 cr).....	3
FRWS 3810 Plant and Animal Populations (suggested elective)	3
PHYX 2110 The Physics of Living Systems I	4

Spring Semester (15 credits)

AWER 4500 Freshwater Ecology	3
AWER 4650 Principles in Fishery Management	3
AWER 5550 Freshwater Invertebrates.....	3
USU Depth Humanities and Arts (DHA) Course	3
Elective Course	3

Senior Year (29 credits)

Fall Semester (15 credits)

AWER 4510 Aquatic Ecology Practicum	3
AWER 5200 Fish Habitat Relationships in Managed Forests	3
ENVS 5320 Water Law and Policy in the United States.....	3
Elective Courses	6

Spring Semester (14 credits)

AWER 5330 Large River Management.....	3
Elective Courses	11

Fisheries Science Minor Requirements (18 credits)

All courses required for the Fisheries Science minor must be taken on an A-B-C-D-F basis. A grade of C- or better is required for all AWER courses used to meet requirements for this minor.

Fisheries Science Core Courses (9 credits)

AWER 3100 (CI) Fish Diversity and Conservation (F)	3
AWER 3700 (CI) Fundamentals of Watershed Science (Sp).....	3
NR 2220 General Ecology (F, Sp)	3

They must also complete 9 credits of Electives, by selecting three courses from the following:

Electives (9 credits)

Select three courses from the following:

AWER 4500 Freshwater Ecology (Sp)	3
AWER 4650 Principles in Fishery Management (Sp).....	3
AWER 5200 Fish Habitat Relationships in Managed Forests (F)	3
AWER 5550 Freshwater Invertebrates (Sp).....	3
FRWS 3810 Plant and Animal Populations (Sp)	3

Department of Aquatic, Watershed, and Earth Resources

Bachelor of Science in Watershed and Earth Systems

Students in the Watershed and Earth Systems major must meet the course requirements for University Studies, as well as complete the Common Departmental Core and Capstone Course listed above. They must also complete 34 credits of Science Foundation and Watershed and Earth Systems courses, plus 34 credits of Directed Electives, as listed below.

A. Science Foundation (19 credits)

CHEM 1210¹ Principles of Chemistry I (F, Sp)	4
GEOL 1150 (BPS) The Dynamic Earth: Physical Geology (F, Sp).....	4
MATH 1210 (QL)² Calculus I (F, Sp, Su).....	4
STAT 3000 (QI) Statistics for Scientists (F, Sp).....	3
PHYX 2210 (QI) General Physics—Science and Engineering I.....	4

¹CHEM 1210 requires a Math ACT score of at least 25 or completion of MATH 1050 or higher. High School chemistry is recommended.

²MATH 1210 requires completion of both MATH 1050 and 1060, or an AP calculus score of at least 3 on the AB test, or a math ACT score of at least 27.

B. Watershed and Earth Systems Courses (15 credits)

AWER 3820 (QI) Climate Change (Sp).....	3
AWER 4750 Fundamentals of Remote Sensing Science (F).....	3
AWER 5150 Fluvial Geomorphology (F).....	3
AWER 5170 Fluvial Geomorphology Lab (F).....	2
SOIL 3000 Fundamentals of Soil Science (F,Sp).....	4

C. Directed Elective Courses (34 credits)

Students must choose a minimum of 34 elective credits to complete the Watershed and Earth Systems degree requirements. The majority of these elective credits must come from courses directly related to the degree program. **All elective courses must be approved by the student's faculty advisor before enrollment.** The following lists of recommended courses could be used to satisfy this requirement.

Watershed Science

AWER 4510 Aquatic Ecology Practicum (F)	3
AWER 4530 Water Quality and Pollution (Sp)	3
AWER 5200 Fish Habitat Relationships in Managed Forests (F)	3
AWER 5640 Riparian Ecology and Management (Sp).....	3
AWER 5660 Watershed and Stream Restoration (Sp).....	2
CHEM 1220 (BPS) Principles of Chemistry II (F, Sp, Su)	4
FRWS 5350 Wildland Soils (Sp).....	3

Geographic Information Science

AWER 5250 Remote Sensing of Land Surfaces (Sp)	4
AWER 5760 Remote Sensing: Modeling and Analysis (Sp)	3
AWER 5930 Geographic Information Analysis (Sp)	4
MATH 1220 (QL) Calculus II (F, Sp, Su)	4
PHYX 2220 (BPS/QI) General Physics—Science and Engineering II.....	4
STAT 6810 Topics in Statistics (Spatial Statistics) (F).....	3

D. General Electives

Students may take the remainder of the 120 credits from any department. The guidelines described under *General Education Requirements* and *University Studies Depth Education Requirements* (see pages 46-54) should be consulted to ensure meeting University Studies Requirements.

Note: Students wanting to pursue federal employment should check the following U.S. Office of Personnel Management website for a listing of required coursework:

<http://www.opm.gov/qualifications/SEC-IV/B/GS1300/1315.HTM>

Watershed and Earth Systems Major Recommended Four-Year Plan of Study

Students should meet regularly with their faculty advisor and carefully plan their academic program, keeping in mind that many upper-division courses have prerequisites and must be taken in sequence. Students following the recommended schedule listed below should be able to complete degree requirements in four years (eight semesters).

Freshman Year (31-32 credits)

Fall Semester (15 credits)

AWER 1020 Aquatic, Watershed, and Earth Resources Professional Orientation	1
CHEM 1210 Principles of Chemistry I.....	4
ECON 1550 (BSS) Introduction to Environmental and Natural Resource Economics (or other approved Breadth Social Sciences course).....	3
ENGL 1010 (CL) Introduction to Writing: Academic Prose	3
GEOL 1150 (BPS) The Dynamic Earth: Physical Geology	4

Spring Semester (16-17 credits)

AWER 3700 (CI) Fundamentals of Watershed Science.....	3
CHEM 1220 (BPS) Principles of Chemistry II (4 cr) or Other approved elective course (3-4 cr).....	3 or 4
MATH 1210 (QL) Calculus I	4
Breadth Creative Arts (BCA) Course	3
Breadth Humanities (BHU) Course	3

Sophomore Year (29-31 credits)

Fall Semester (16-17 credits)

ENGL 2010 (CL) Intermediate Writing: Research Writing in a Persuasive Mode	3
MATH 1220 (QL) Calculus II (4 cr) or Other approved elective course (3-4 cr).....	3 or 4
PHYX 2210 (QI) General Physics—Science and Engineering I.....	4
STAT 3000 (QI) Statistics for Scientists	3
USU Depth Course (CI).....	3

Spring Semester (13-14 credits)

AWER 3820 (QI) Climate Change.....	3
PHYX 2220 (BPS/QI) General Physics—Science and Engineering II (4 cr) or Other approved elective course (3-4 cr).....	3 or 4
SOIL 3000 Fundamentals of Soil Science.....	4
Breadth American Institutions (BAI) Course	3

Junior Year (30 credits)

Fall Semester (17 credits)

AWER 4490 Small Watershed Hydrology	4
AWER 4750 Fundamentals of Remote Sensing Science	3
AWER 4930 Geographic Information Systems	4
ENVS 5320 Water Law and Policy in the United States.....	3
Breadth Life Sciences (BLS) Course.....	3

Spring Semester (13 credits)

AWER 4500 Freshwater Ecology	3
Depth Humanities and Creative Arts (DHA) Course.....	3
Elective Course(s).....	7

Senior Year (30 credits)

Fall Semester (15-16 credits)

AWER 4980 Undergraduate Seminar	1
AWER 5150 Fluvial Geomorphology.....	3
AWER 5170 Fluvial Geomorphology Lab.....	2
ENVS 4000 (DSS) Human Dimensions of Natural Resource Management (3 cr) or Other approved DSS course (3-4 cr).....	3 or 4
Elective Courses	6

Department of Aquatic, Watershed, and Earth Resources

Spring Semester (15 credits)

AWER 4530 Water Quality and Pollution (3 cr) or Approved Natural Resources Capstone Experience (3 cr)	3
Elective Courses	12

Geographic Information Science Minor Requirements (18-19 credits)

All courses required for the Geographic Information Science minor must be taken on an *A-B-C-D-F* basis. A grade of *C-* or better is required for all AWER courses used to meet requirements for this minor.

A. Watershed and Earth Resources Core Courses (12 credits)

AWER 4930 Geographic Information Systems (F).....	4
AWER 5930 Geographic Information Analysis (Sp)	4
CS 1700 Introduction to Computer Science—CS 1 (F,Sp,Su)	3
CS 1710 Introduction to Computer Science—CS 1 Lab (F,Sp,Su)	1

B. Electives (6-7 credits)

Select two courses from the following:

AWER 4750 Fundamentals of Remote Sensing Science (F).....	3
AWER 5250 Remote Sensing of Land Surfaces (Sp)	4
FRWS 5750 Applied Remote Sensing (Sp).....	3
AWER 5760 Remote Sensing: Modeling and Analysis (Sp)	3
CEE 6440 Geographic Information Systems in Water Resources (F)...	3

Watershed Science Minor Requirements (15-16 credits)

All courses required for the Watershed Science minor must be taken on an *A-B-C-D-F* basis. A grade of *C-* or better is required for all AWER courses used to meet requirements for this minor.

A. Required Courses (10 credits)

AWER 3700 (CI) Fundamentals of Watershed Science (Sp).....	3
AWER 4490 Small Watershed Hydrology (F).....	4
AWER 4530 Water Quality and Pollution (Sp)	3

B. Electives (5-6 credits)

Select two courses from the following:

AWER 4500 Freshwater Ecology (Sp).....	3
AWER 5150 Fluvial Geomorphology (F)	3
AWER 5640 Riparian Ecology and Management (Sp).....	3
AWER 5660 Watershed and Stream Restoration (Sp).....	2

Financial Assistance

The main sources of undergraduate financial assistance include University scholarships, grants-in-aid, work-study, and loans. In addition, more than 30 scholarships are offered for eligible students in the College of Natural Resources.

Scholarships are awarded for scholastic and professional achievements at the department, College of Natural Resources, and University level. For more information, contact College of Natural Resources academic advisors. Grants-in-aid and work-study are available from the Financial Aid Office. In addition, departmental faculty often employ undergraduate students to assist in research, extension, and outreach projects. These projects often involve field and laboratory data collection, data management and analysis, and report preparation.

Departmental Honors

Students who would like to experience greater academic depth within their major are encouraged to enroll in departmental honors. Through original, independent work, Honors students enjoy the benefits of close supervision and mentoring, as they work one-on-one with faculty in select upper-division departmental courses. Honors students also complete a senior project, which provides another opportunity to collaborate with faculty on a problem that is significant, both personally and in the student's discipline. Participating in departmental honors enhances students' chances for obtaining fellowships and admission to graduate school. Minimum GPA requirements for participation in departmental honors vary by department, but usually fall within the range of 3.30-3.50. Students may enter the Honors Program at almost any stage in their academic career, including at the junior (and sometimes senior) level. The campus-wide Honors Program, which is open to all qualified students regardless of major, offers a rich array of cultural and social activities, special classes, and the benefit of Honors early registration. Interested students should contact the Honors Program, Merrill Library 374, (435) 797-2715, honors@cc.usu.edu. Additional information can be found online at:

<http://www.usu.edu/honors/>

Additional Information

For additional information about the Bachelor of Science requirements, course sequencing, and departmental specialization options and their related coursework, as well as updated information describing current programs and courses offered by the Department of Aquatic, Watershed, and Earth Resources, visit the Aquatic, Watershed, and Earth Resources main office, Natural Resources 210, or visit <http://www.cnr.usu.edu/awer>. Major requirement sheets may be obtained at the departmental office, or online at: <http://www.usu.edu/ats/majorsheets/>

Graduate Programs

Admission Requirements

General admission requirements apply, in addition to the requirements which follow. Although admission to the graduate program is treated on an application-by-application basis, the following are usually required: (1) a bachelor's degree from an accredited college or university; (2) a GPA of 3.2 or better (out of 4.0) for the most recent two years of academic coursework; (3) combined verbal and quantitative GRE scores above the 40th percentile; and (4) a letter of "interest and purpose" detailing the applicant's reasons for seeking an advanced degree. Foreign students should have a TOEFL score of at least 550. The written statement of interest helps match applicants with faculty advisors. A faculty member must agree to serve as the major professor in order for an applicant to be accepted. Prospective students are encouraged to contact faculty members early in the application process to investigate mutual interests, projects, and prospects for financial support.

Previous training in the field is not a prerequisite for admission, although a sound background in the physical and biological sciences is recommended. Successful applicants without the necessary background will be expected to obtain it in the course of their studies for the advanced degree.

Department of Aquatic, Watershed, and Earth Resources

Degree Programs

A Master of Science degree in Fisheries Biology or Watershed Science, with emphasis on the management of fisheries or watershed resources directed toward decision-making roles in natural resource agencies, is offered for the applicant with previous agency experience and for the student motivated toward an administrative career. A Doctor of Philosophy degree in Fisheries Biology, Ecology, or Watershed Science is provided for students interested in pursuing a research or academic career.

A thesis or dissertation based on original research performed by the student is required. Written comprehensive examinations are required of all students pursuing the PhD degree. At the discretion of the student's graduate supervisory committee, an additional oral examination may be required.

The minimum requirement for an MS degree is 30 credits, including at least 24 credits in residency and 6 credits of thesis research. The minimum requirement for a PhD degree is 60 approved graduate credits in addition to an MS degree, or 90 approved graduate credits with no MS degree. At least one year (a minimum of 32 credits), including a minimum of two consecutive semesters, of full-time registration must be in residence at USU.

With committee approval, graduate credit may be transferred from accredited graduate schools, provided the minimum residency requirement (including thesis and dissertation credit) at USU is met. Transfer credit, which must not have been used for any other degree, will be shown on official USU transcripts at completion of the degree.

Master of Natural Resources

The department also participates in the College of Natural Resources Master of Natural Resources (MNR) degree program. For more information, see page 369.

Specializations

The MS and PhD degrees in Fisheries Biology and Ecology allow students to specialize in either Fisheries Management or Aquatic Ecology.

Financial Assistance

General aspects of financial support for graduate students at Utah State University are listed on pages 92-93 in the *Graduate Financial Assistance* section. This includes important information on the University-wide policies and terms of reference for research and teaching assistantships, graduate tuition obligations and benefits, Western Regional Graduate Programs, and competitive University-wide fellowships and scholarships.

Assistantships

Research assistantships are available through individual faculty members who hold research grants or contracts. Occasionally, teaching assistantships are available through the department. Recipients of teaching assistantships are usually selected from among PhD students.

Western Regional Graduate Programs

The MS and PhD in Watershed Science are Western Regional Graduate Programs. For more information, see page 92.

Aquatic, Watershed, and Earth Resources Faculty

Professors

Todd A. Crowl, aquatic ecology and conservation biology
Charles P. Hawkins, stream ecology, conservation biology, and biomonitoring
Chris Luecke, lake ecology and fisheries
Wayne A. Wurtsbaugh, limnology, fish ecology, and watershed biogeochemistry

Research Professor

Jeffrey L. Kershner, USDA Forest Service, national habitat coordinator, stream ecology and fish-habitat relationships

Adjunct Professors

Christopher Neale, remote sensing
David G. Tarboton, geomorphology, hydrology
James P. Dobrowski, watershed hydrology, management, and restoration

Professors Emeriti

John A. Kadlec, wetland ecology and biogeochemistry
John M. Neuhold, fisheries biology

Associate Professors

Robert R. Gillies, remote sensing and meteorology
John C. Schmidt, fluvial geomorphology and water policy
Helga Van Miegroet, biogeochemistry, soils, and ecosystem ecology

Adjunct Associate Professor

Joanna L. Endter-Wada, cultural anthropology, natural resource policy and sociology

Assistant Professors

Phaedra E. Budy, assistant leader, fisheries, Utah Cooperative Fisheries and Wildlife Research Unit, fisheries management and aquatic ecology
Nancy O. Mesner, water quality, water policy, and modeling
Michael A. White, ecosystem modeling, remote sensing, and global climatology

Research Assistant Professor

Mark R. Vinson, aquatic invertebrate ecology and biomonitoring

Adjunct Assistant Professors

Michelle A. Baker, ecology, hydrology
David A. Beauchamp, food webs, bioenergetics models, predator-prey interactions, visual foraging
Nicolaas W. Bouwes, Jr., fisheries management, aquatic ecology
Anne Brasher, ecology specialist, water quality assessment
David G. Chandler, hydrology
David Naftz, geochemist
Joel L. Pederson, geomorphology, paleoclimatology, and sedimentology
Brett Roper, USDA Forest Service Aquatic Monitoring Center Program Leader, aquatic ecologist
Juergen Symanzik, computational and graphical statistics
J. Christopher Wilson, director, State of Utah Division of Wildlife Resources Fisheries Experiment Station, fish pathologist/nutritionist

Course Descriptions

Aquatic, Watershed, and Earth Resources (AWER), pages 455-458

Department of Art

Department Head: John Neely
Location: Fine Arts Visual 122
Phone: (435) 797-3460
FAX: (435) 797-3412
E-mail: mroberts@cc.usu.edu
WWW: <http://www.art.usu.edu/index1.php>

Assistant Head and Undergraduate Program Director:
Sara J. Northern, Fine Arts Visual 220, (435) 797-9987,
northern@cc.usu.edu

Assistant Head and Graduate Program Director:
Christopher T. Terry, Fine Arts Visual 216, (435) 797-3409,
cterry@cc.usu.edu

Art Education Undergraduate Advisor:
Jane S. Catlin, Fine Arts Visual 114, (435) 797-3469,
jcatlin@hass.usu.edu

Degrees offered: Bachelor of Arts (BA), Bachelor of Science (BS),
Bachelor of Fine Arts (BFA), Master of Arts (MA), and Master of Fine
Arts (MFA) in Art

Undergraduate emphases: Art Education, Art History, Ceramics,
Drawing, Graphic Design, Painting, Photography, Printmaking,
Sculpture

Graduate specializations: Ceramics, Drawing, Graphic Design,
Painting, Photography, Printmaking, Sculpture

Undergraduate Programs

Objectives

The Department of Art's primary goal is to prepare undergraduate students for careers in either teaching or the applied and fine arts. Requirements in nine different emphasis areas address the specific needs of each career. The Department of Art also serves the University community by offering courses in the University Studies program and by offering training in applied art areas for students in related degree programs.

Departmental Admission Requirements

Entering freshmen are admitted to the Department of Art as BS candidates by meeting the Utah State University admission requirements. New freshmen admitted to USU in good standing must submit a portfolio of 10 35 mm slides of their best work. Details are available from the Art Department. Entrance to the BFA program in studio art is accomplished by formal application after completion of the department's foundation courses. Students applying for this degree program should have a GPA of at least 2.75. Application to the BFA program is done by portfolio review and should be made during the spring semester in which the prerequisites will be completed. Transfer students should make application during the spring semester prior to their entrance to USU to arrange for the portfolio review of their work prior to acceptance in the department. Participation in the BA program in Art History is limited to students with at least a 2.5 GPA.

Degrees Offered

Bachelor of Science Degree

The BS degree is a general art degree for the student who is not

interested in specializing in one area of art. This degree requires 50 semester credits in Art courses, 30 credits in University Studies courses, and allows for 40 elective credits. A GPA of 2.5 is required for the BS degree. No grade less than C is acceptable in any art class. Art classes may be retaken for a higher grade. This degree does not fulfill the requirements for entrance into graduate schools of art.

Bachelor of Arts Degree

This degree is available primarily to students selecting an emphasis in Art History at USU. BA degree candidates should complete the majority of University Studies lower-division requirements, the modern language requirement, and the foundation curriculum by the end of the sophomore year. This will allow concentration in an area of specialization during the junior and senior years.

In addition, BA candidates must either complete requirements for the Art History Emphasis, as listed below, or the general art requirements as listed under the BS degree. The major professor may also prescribe other courses to serve the particular needs of different students. A minimum of 36 semester credits in art is required for a BA degree in Art with an Art History Emphasis. Students who desire to receive a BA degree in Art *without an emphasis*, must earn a minimum of 50 semester credits in art.

Bachelor of Fine Arts Degree

The BFA is a professional art degree requiring above-average accomplishment in art. Only students demonstrating considerable promise will be accepted for this more demanding professional degree program. Admission to the Art Department BS program *does not* guarantee admission to the BFA program. Entrance to the BFA program is by application only. Each emphasis area specifies classes that must be completed, along with the common foundation courses, prior to application to the BFA program. For most students, this will occur at the end of their sophomore year. Transfer students may make application during the spring semester prior to their planned entrance into the department.

To graduate with a BFA degree, students must meet the following minimum requirements:

1. A **career total** GPA of at least 2.75 must be attained.
2. Students must maintain a minimum GPA of at least 2.75 in the Art Foundation and Art Basic Core classes.
3. No grade lower than a C will be accepted in any art class.
4. In any emphasis area class, no grade lower than a B- is acceptable. Emphasis classes may be retaken for a higher grade.

A minimum of 70 semester credits in art must be completed for the BFA degree. This includes 6 credits of upper-division art history. During the spring semester of their senior year, students must take ART 4910 (Senior BFA Exhibition). Students must also fulfill the standard University Studies requirement of 30 credits, as well as complete 20 credits of electives. Any student unable to complete the necessary requirements for the BFA may still qualify for the BS degree.

Department of Art Curriculum

Foundation Courses

Students in the BS, BA, and BFA degree programs (except for students in the Art History emphasis) need to complete the following foundation curriculum. (Art History students should *instead* complete the BA foundation courses, which are listed in the *Art History* section.)

Suggested Sequence:

Freshman year—first semester:

ART 1110 Drawing I (3 cr) or	
ART 1140 Drawing I (Art Majors Only) (3 cr)	3
ART 1120 Two-dimensional Design (3 cr) or	
ART 1150 Two-dimensional Design (Art Majors Only) (3 cr)	3
ART 2710 (BHU) Survey of Western Art: Prehistoric to Medieval	3

Freshman year—second semester:

ART 1130 Three-dimensional Design (3 cr) or	
ART 1160 Three-dimensional Design (Art Majors Only) (3 cr).....	3
ART 2140 Drawing II.....	3
ART 2720 (BHU) Survey of Western Art: Renaissance to Post-Modern.....	3

Subsequent curriculum requirements are specific to these individual emphasis areas:

Art Education

The art education curriculum prepares students to teach art in the public schools. Students graduate with a Bachelor of Fine Arts (BFA) degree in art and obtain a secondary education teaching license. The BFA degree requires 70 credits in Art courses. A minimum of 45 credits must be completed in the core and broadening area:

ART 1110 Drawing I (F, Sp) (3 cr) or	
ART 1140 Drawing I (Art Majors Only) (F, Sp) (3 cr).....	3
ART 1120 Two-dimensional Design (F, Sp) (3 cr) or	
ART 1150 Two-dimensional Design (Art Majors Only) (F, Sp) (3 cr)....	3
ART 1130 Three-dimensional Design (F, Sp) (3 cr) or	
ART 1160 Three-dimensional Design (Art Majors Only) (F, Sp) (3 cr) .	3
ART 2140 Drawing II (Sp).....	3
ART 2200 Painting I (F)	3
ART 2230 Basic Printmaking (F)	3
ART 2400 Computers and Art (Sp).....	3
ART 2600 Basic Sculpture (F, Sp)	3
ART 2650 Introduction to Ceramics (F, Sp, Su).....	3
ART 2710 (BHU) Survey of Western Art: Prehistoric to Medieval (F)..	3
ART 2720 (BHU) Survey of Western Art: Renaissance to Post-Modern (Sp)	3
ART 2800 Introduction to Photography (F)	3
ART 2810 Photography I (F, Sp).....	3

In addition, 6 credits are required in upper-division art history courses. A minimum of 25 art credits must be taken in a specialization area. The secondary education teaching license requires the following courses:

ART 3000 Secondary Art Methods I (F, Sp).....	3
ART 3300 Clinical Experience I (Sp)	1
ART 4000 Secondary Art Methods II (F)	3
ART 4300 Clinical Experience II (F)	1
ART 5500 Student Teaching Seminar (F, Sp).....	2
ART 5630 Student Teaching in Secondary Schools (F, Sp).....	10
INST 3500 Technology Tools for Secondary Teachers (F, Sp, Su).....	1
SCED 3100 Motivation and Classroom Management (F, Sp).....	3
SCED 3210 (DSS/CI) Educational and Multicultural Foundations (F, Sp).....	3
SCED 4200 (CI) Reading, Writing, and Technology (F, Sp).....	3
SCED 4210 Cognition and Evaluation of Student Learning (F, Sp)	3
SPED 4000 Education of Exceptional Individuals (F, Sp, Su).....	2

Art History (52 total credits)

For the BA degree in Art with an emphasis in Art History, all students must take the following required foundation courses (15 credits):

ART 2710 (BHU) Survey of Western Art: Prehistoric to Medieval (F)..	3
ART 2720 (BHU) Survey of Western Art: Renaissance to Post-Modern (Sp)	3

HIST 1040 (BHU) Foundations of Western Civilization: Ancient and Medieval (F, Sp, Su)	3
HIST 1050 (BHU) Foundations of Western Civilization: Modern (F, Sp, Su)	3

One studio art course of student's choice (note prerequisites where necessary)

All majors must choose between the following two tracks, and must meet with their advisor to determine a concentration and special area by the beginning of their sophomore year. In addition, the student should have produced two research papers of 10-15 pages each by the senior year.

Track I (18 credits): Students must complete six upper-division courses in art history, consisting of three interrelated courses (e.g., by period) and three distributed widely (i.e., a concentrator in a modern period of art history would select courses from the ancient or medieval, renaissance, and Baroque periods to achieve the wide distribution).

Track II (Interdisciplinary Track) (18 credits): Students must complete three upper-division courses in Art History and two upper-division courses outside the department that make up a special field (these may be combined from area studies, such as the British Commonwealth, French Studies, American Studies, Folklore, or Anthropology; or may consist of a selection of courses that deal with post-colonialism, Women and Gender Studies, and the intersections between art and the history of science, for example; or may include courses that deal with a certain period).

The student must formally apply, in consultation with his or her advisor, to determine the concentration and special area. One additional course in Art History (outside the special field) must also be completed. All majors are required to take ART 4790, Research/Writing/Methods (3 credits, offered every year). Students will be advised to take this seminar after they have written a research paper. Students are required to produce a self-assessment portfolio. During the second semester, senior majors must provide a portfolio of their work in art history. No credit is granted for the portfolio (which is not a class). The portfolio consists of a two-page self-assessment of the student's work and progress in the major; a list of classes taken in art history, studio art, and any related fields that have contributed to the student's understanding of art history; and examples of the student's work in art history at all levels, including study-abroad work and internship experiences.

Foreign Language (16 credits): Four semesters of one foreign language are required. (French and German are especially recommended for students who plan to go on to graduate school, but a student may petition to have another foreign language count toward this goal.)

Including foundation, foreign language, and major classes, the Art History emphasis requires a total of 52 credits.

Ceramics

Contemporary ceramics represents the extension and synthesis of clay sculpture and vessel traditions. Students are acquainted with the technology of ceramic materials and firing processes, while developing sound craftsmanship as a means to personal expression. Enrichment is provided through the ceramics collection of the Nora Eccles Harrison Museum, numerous ceramics exhibitions, and visiting guest artists. Juniors and seniors in the program may compete for one of the Ellen Stoddard Eccles Scholarships, an endowed scholarship fund set aside especially for undergraduate ceramics majors. Students must complete the following courses for a Ceramics emphasis:

Department of Art

ART 2600 Basic Sculpture (F, Sp)	3
ART 2650 Introduction to Ceramics (F, Sp, Su)	3
ART 3610 Intermediate Sculpture (F)	3
ART 3650 Intermediate Ceramics: Handbuilding (F)	3
ART 3660 Intermediate Ceramics: Throwing on the Potter's Wheel (Sp).....	3
ART 4640 ¹ Technology of Ceramic Art (F, Sp, Su).....	6
ART 4650 ² Advanced Ceramic Studio (F, Sp, Su)	12
ART 4910 Senior BFA Exhibition (Sp).....	2
Two upper-division Art History courses	6
CHEM 1010 (BPS) Introduction to Chemistry (F, Sp) (3 cr) or	
CHEM 1110 (BPS) General Chemistry I (4 cr) (F, Sp)	3 or 4
GEOL 1100 (BPS) Geology of National Parks: Introduction to Geology (F, Su) (3 cr) or	
GEOL 1150 (BPS) The Dynamic Earth: Physical Geology (F, Sp) (4 cr)	3 or 4

¹ART 4640 is repeatable for credit, and must be taken during at least two semesters.

²ART 4650 is repeatable for credit, and must be taken during at least four semesters.

Drawing

Drawing is the two-dimensional study of form and space, as well as the exploration of drawing media, graphic elements, and visual dynamics. It is an essential discipline for all artists, as it provides the fundamental visual skills needed in their search for a personal idiom. At the same time, drawing itself is also a vehicle of creative expression, visual adventure, and self-discovery. Students must complete the following courses for a Drawing emphasis:

ART 2200 Painting I (F)	3
ART 2230 Basic Printmaking (F).....	3
ART 2400 Computers and Art (Sp)	3
ART 2600 Basic Sculpture (F, Sp) (3 cr) or	
ART 2650 Introduction to Ceramics (F, Sp, Su) (3 cr).....	3
ART 3200 Painting II (Sp)	3
ART 4100 Drawing Studio (F, Sp, Su).....	6
ART 4210 Figure Painting (Sp)	3
ART 4260 Life Drawing (Sp)	3
ART 4910 Senior BFA Exhibition (Sp).....	2
Two additional upper-division Art History courses (required)	6

One course must be chosen from:

ART 3230 Lithography (F).....	3
ART 3240 Intaglio (Sp).....	3
ART 3250 Relief Prints (F)	3

The remainder of the 70 semester credits can be taken as electives.

Graphic Design

Graphic design is the study of visual communications and the art of presenting information. Visual elements, such as animation, photography, illustration, symbols, and type, are designed or arranged using various techniques and materials. Materials range from traditional ink, paper, and printing presses to video and the Internet, using the latest computer software and hardware. Students in graphic design complete a variety of courses that involve working with symbols, trademarks, typography, layout, and all formats of print and publication design. Illustration, digital imaging, motion graphics, animation, and interactive media are also part of the graphic design curriculum. Seniors may specialize in one or more of these areas of study and create a professional portfolio specific to their interests. Graphic Design emphasis students should complete the following courses:

ART 2400 Computers and Art (Sp)	3
ART 2800 Introduction to Photography (F) (3 cr) or	
ART 2810 Photography I (F, Sp) (3 cr).....	3

ART 3400 Graphic Design I (F).....	3
ART 3410 Intermediate Computers and Art (Sp)	3
ART 3420 ³ Communication Arts Seminar (F, Sp).....	4
ART 4910 Senior BFA Exhibition (Sp).....	2
Additional Art Basic Core Courses	6
Two upper-division Art History courses (3000- or 4000-level).....	6
A total of 18 semester credits must be taken in 4000-level graphics courses.	

³ART 3420 is repeatable for credit, and must be taken during a minimum of four semesters.

Painting

The painting curriculum emphasizes an analysis of historical approaches to painting, and the exploration of new ideas, techniques, and materials. Basic courses are designed to foster a respect for the craft of painting, and subsequent courses encourage application of the craft to expressive goals. Central to the focus of painting study at USU is the development of a personal portfolio reflecting the specific interests of the individual. Students must complete the following courses for a Painting emphasis:

ART 2200 Painting I (F)	3
ART 2230 Basic Printmaking (F).....	3
ART 2400 Computers and Art (Sp)	3
ART 2600 Basic Sculpture (F, Sp) (3 cr) or	
ART 2650 Introduction to Ceramics (F, Sp, Su) (3 cr).....	3
ART 3200 Painting II (Sp)	3
ART 3610 Intermediate Sculpture (F)	3
ART 4200 Advanced Painting Studio (F, Sp)	6
ART 4210 Figure Painting (Sp)	3
ART 4260 Life Drawing (Sp)	3
ART 4910 Senior BFA Exhibition (Sp).....	2
Two upper-division courses in Art History	6

In addition, one course must be selected from the following:

ART 3230 Lithography (F).....	3
ART 3240 Intaglio (Sp).....	3
ART 3250 Relief Prints (F)	3

Photography

Found throughout all of contemporary life, photographic images shape the way we document, interpret, and direct our lives. As an art form, photography constantly reinvents our concept of beauty, reality, and culture. Within the program in photography, students learn the aesthetic and technical skills of the medium. The fundamentals of craft and the "hands on" application of knowledge at each level will enable the student to pursue a variety of photographic professions. Requirements for the Photography emphasis include:

ART 2810 Photography I (F, Su)	3
ART 3810 Photography II (Sp).....	3
ART 3820 History of Early Photography (Sp)	3
ART 3830 History of Contemporary Photography (Sp).....	3
ART 4810 Digital Photography (F)	3
ART 4820 Nineteenth Century Photography Printing Processes (F)....	3
ART 4830 Independent Projects in Photography (F, Sp, Su).....	6
ART 4840 Color Photography I (F)	3
ART 4850 Color Photography II (Sp)	3
ART 4860 Photographic Studio (F)	3
ART 4870 Photographic Portfolio (Sp).....	3
ART 4910 Senior BFA Exhibition (Sp)	2

Printmaking

Students in the printmaking emphasis have the opportunity to explore all aspects of traditional and contemporary printmaking. After an introduction to the basics of intaglio, lithographic, silkscreen, and relief processes, students are encouraged to continue their development in

a specific area of interest. Independent studio projects will investigate the wide field of printmaking, providing a framework for the student to become engaged in a creative pursuit involving both technical and aesthetic considerations. Requirements for the Printmaking emphasis include:

ART 2230 Basic Printmaking (F).....	3
ART 2800 Introduction to Photography (F) (3 cr) or	
ART 2810 Photography I (F, Sp) (3 cr).....	3
ART 3230 ⁴ Lithography (F)	3
ART 3240 ⁴ Intaglio (Sp)	3
ART 3250 ^{4,5} Relief Prints (F)	3
ART 4250 Advanced Printmaking Studio (F, Sp)	9
ART 4910 Senior BFA Exhibition (Sp)	2
Two additional upper-division Art History courses, 3000-level and above (required)	6

⁴A total of 12 credits must be taken in a combination of ART 3220, 3230, 3240, and 3250.

⁵ART 3250 may be repeated for credit.

Sculpture

Sculpture is the three-dimensional expression of ideas. Its range extends from discrete, permanent objects to ephemeral, multi-media environments. Students in the sculpture emphasis develop a base of knowledge in traditional approaches to the creation of form. After gaining competency in figure modeling, as well as in stone or wood carving, they explore both site-specific sculpture and sculptural installations. Intermediate and advanced students investigate specific problems involving technical, aesthetic, and conceptual considerations. They develop their own direction, based on both experience with form, materials, and techniques, and an understanding of traditional concerns and contemporary issues in the vast field encompassed today by sculpture.

The following courses are required for students in the sculpture emphasis:

ART 2600 Basic Sculpture (F, Sp)	3
ART 2650 Introduction to Ceramics (F, Sp, Su)	3
ART 2800 Introduction to Photography (F) (3 cr) or	
ART 2810 Photography I (F, Sp) (3 cr).....	3
ART 3610 Intermediate Sculpture (F)	3
ART 4660 Advanced Sculpture Studio (Sp)	9
ART 4910 Senior BFA Exhibition (Sp).....	2
Two additional upper-division Art History courses (required)	6

Other required courses outside of the Art Department are: two courses from the Engineering and Technology Education Department, and one design course taken through Landscape Architecture and Environmental Planning (LAEP), Theatre Arts (THEA), or Interior Design (ID).

Minor Requirements

Art Minor

The requirements for a minor in studio art are flexible. To plan a minor in Art, students should meet with an advisor. Generally, the minimum requirements include:

ART 1110 Drawing I (F, Sp).....	3
ART 1120 Two-dimensional Design (F, Sp).....	3
ART 1130 Three-dimensional Design (F, Sp).....	3
ART 2710 (BHU) Survey of Western Art: Prehistoric to Medieval (F) (3 cr) or	
ART 2720 (BHU) Survey of Western Art: Renaissance to Post-Modern (Sp) (3 cr).....	3
Credits in specialization area	12

Art History Minor

The requirements for a minor in art history include 24 credits from classes in the Art History group, excluding Art 1100 Drawing I.

USU does not offer an art teaching minor for secondary teachers.

Students choosing to train for teaching art in secondary schools must complete the art education major listed under art specialties and must comply with all requirements listed by the Department of Secondary Education.

Departmental Honors

Students who would like to experience greater academic depth within their major are encouraged to enroll in departmental honors. Through original, independent work, Honors students enjoy the benefits of close supervision and mentoring, as they work one-on-one with faculty in select upper-division departmental courses. Students wishing to pursue departmental honors in art must have a cumulative GPA of 3.30 or higher, and must first be admitted to the BFA program. Once that process is completed, they should meet with Sara Northerner, the departmental honors advisor, to complete an honors program of study contract form. Dr. Northerner may be contacted at: Fine Arts Visual 220, (435) 797-9987, or by e-mail at northern@cc.usu.edu.

The 15-credit requirement for Departmental Honors in Art is met in the following manner:

1. At least 6 credits in upper-division Art or Art History courses must be taken with an honors contract.
2. At least 3 credits must be completed in an Honors Depth Life and Physical Sciences (DSC) course or in an Honors Depth Social Sciences (DSS) course.
3. At least 3 credits of upper-division coursework must be completed in the emphasis area or from outside the department, and must be taken with an honors contract.
4. Students must complete ART 4910 (Senior BFA Exhibition, 2 credits), along with at least 1 credit in HONR 4900H (Senior Thesis/Project, 1-3 credits).

To qualify for departmental honors in art, students must graduate with a cumulative GPA of at least 3.30 in their upper-division coursework taken as part of their departmental honors contract, and must present their work in a public forum (such as the Senior BFA show and/or Student Showcase).

Additional Information

For additional information about undergraduate requirements in the Department of Art, see the major requirement sheet, which can be obtained from the department, or accessed online at: <http://www.usu.edu/ats/majorsheets/>

Graduate Programs

The Department of Art offers two graduate degrees and cooperates with the College of Education and Human Services on another degree. The Master of Arts (MA) and the Master of Fine Arts (MFA) are offered by the Art Department. A Master of Education (MEd) with a specialization in art is offered through the College of Education and Human Services.

Department of Art

Master of Arts

Students are selected for the MA program on the basis of a portfolio demonstrating artistic individuality and a level of development beyond the need of classroom instruction.

Admission Requirements

All applicants are required to have earned a bachelor's degree in the visual arts or its equivalent. During the last two years of undergraduate work, the GPA in art courses must have been at least 3.0 on a 4 point scale. MAT scores should be at or above the 40th percentile. Applicants taking the GRE should have verbal and quantitative scores at or above the 40th percentile.

Degree Requirements

Candidates for the MA must complete a minimum of 30 credits, to include: (1) 21 graduate studio credits, which may be divided into two or three areas of study at the graduate level; (2) 3 credits which may be earned in classes outside the department; (3) 3 credits of art history; and (4) 3 credits of Research and Thesis.

A total of 12 credits of art history, including undergraduate credits, is required for graduation, but only 3 credits earned as a matriculated graduate student at USU may be applied toward the 30-credit MA requirement. The additional 9 credits of art history may include credits earned at the undergraduate level.

A candidate must complete a minimum of two semesters in residency. Nine credits per semester is considered full-time graduate enrollment, while 12 credits are considered the maximum enrollment. A minimum of three semesters is thus required to complete the 30-credit program.

Master of Fine Arts

The Master of Fine Arts degree is the terminal degree in the visual arts field. The MFA program is designed to allow students to mature to a level of professional competence in the making of art. Related studies augment a rigorous studio program. The prospective student must exhibit both academic excellence and a well-developed personal artistic vision.

Admission Requirements

All applicants are required to have earned a BFA degree in the visual arts or its equivalent, including a minimum of 12 credits of art history. *Students must submit either MAT or GRE scores.* GPA in art courses must have been at least 3.0 on a 4-point scale. MAT scores should be at or above the 40th percentile. Applicants taking the GRE should have verbal and quantitative scores at or above the 40th percentile.

Degree Requirements

Students must earn 60 credits, to include: (1) 43 credits of graduate-level studio art as determined by the student in consultation with his or her major professor, including a minimum of 6 credits outside of the emphasis area; (2) 6 credits of Graduate Seminar; (3) 2 credits of Graduate Interdisciplinary Critique; (4) 6 credits outside the Art Department as specified by the supervisory committee; and (5) 3 credits of Research and Thesis, which concludes with an MFA thesis exhibition and an oral defense. The MFA thesis is a visual presentation, the equivalent of a written dissertation in other disciplines. The thesis exhibition is the single most important feature of the MFA program; the culmination of at least two years, and often three or more years, of intensive study in a single discipline. The student must also submit a selection of slides documenting the exhibition.

The MFA program is a resident program; it is not possible to complete the requirements for graduation by correspondence. The program is predicated upon the assumption that students will live in the Logan area. Students must complete a minimum of four semesters in residency. Nine credits per semester is considered full-time graduate enrollment, while 12 credits are considered the maximum enrollment. A minimum of five semesters is thus required to complete the 60-credit program; most students require three years.

Application Procedures

Completed applications must include: (1) completed application forms; (2) a letter of intent; (3) transcripts of all previous graduate and undergraduate work; (4) three letters of recommendation from qualified professionals; (5) GRE or MAT scores; and (6) the \$50 application fee.

These materials must be sent directly to the School of Graduate Studies. When complete, applications will be forwarded by the School of Graduate Studies to the Art Department for review.

A portfolio of twenty 35mm slides of recent work must be mailed directly to: Graduate Coordinator, Department of Art, Utah State University, 4000 Old Main Hill, Logan UT 84322-4000.

Completed applications and slide portfolios must be received by **February 1**. Students should note that applications will be considered *only* at this time, and *only* completed applications will be reviewed. Admission will *only* be considered for fall semester. The deadlines for financial aid may be earlier than the admissions deadline. For further information about financial aid, visit the Financial Aid Office in Taggart Student Center 106; write to: Financial Aid Office, Utah State University, 1800 Old Main Hill, Logan UT 84322-1800; or phone (435) 797-0173.

Applications are reviewed by the Art Department faculty. Candidates are selected primarily on the basis of their **portfolio**, which should demonstrate a level of development beyond the need of classroom instruction and encouragement. The faculty will also look in the portfolio for evidence of significant personal exploration.

Secondary to the portfolio, but important nonetheless, the applicant's **letter of intent** and **letters of recommendation** will also be given careful consideration. In reviewing these letters, the faculty will look for, among other things, indications that the applicant will be capable of prolonged and concentrated effort, guided by realistic personal goals. Letters should address both academic and artistic accomplishments, as well as potential for further growth in both of these areas.

Applicants are strongly encouraged to visit the USU campus and meet with the faculty in their proposed field of study *well in advance* of the February 1 application deadline.

Important Note. Please note that the graduate programs in the Art Department have limited enrollment; admission is *very* competitive. Because only a small fraction of applicants can be accommodated, there can be no guarantee that applicants who meet minimum admission requirements will be accepted into master's programs.

Financial Assistance

Departmental support is available to graduate students on a competitive basis. Students requesting financial support should apply to the department by February 15. Other assistance is available through the University Financial Aid Office. Students should note that applications for Federal work-study should be mailed during the first week of February.

Art Faculty

Professors

Craig J. Law, photography
John Neely, ceramics
Christopher T. Terry, drawing, painting

Professors Emeritus

Jon I. Anderson, graphic design
Glen L. Edwards, illustration
Adrian Van Suchtelen, drawing

Associate Professors

Jane S. Catlin, art education, painting
Alan Hashimoto, graphic design
Sara J. Northerner, photography

Associate Professor Emeritus

Marion R. Hyde, printmaking, art education

Assistant Professors

Eileen Doktorski, sculpture
JinMan Jo, sculpture
Julie M. Johnson, art history
Laura Johnson, drawing, painting
J. Daniel Murphy, ceramics
Alexa Sand, art history
Robert Winward, graphic design
Koichi Yamamoto, printmaking

Course Descriptions

Art (ART), pages 458-462

Asian Studies Major and Minor

Program Director: R. Edward Glatfelter
Location: Main 333
Phone: (435) 797-1196
FAX: (435) 797-1092
E-mail: ed.glatfelter@usu.edu

Major

To graduate with a BA degree in Asian Studies, students must complete a minimum of 27 credits approved by the Asian Studies program director. The program must include a minimum of 18 credits selected from the Core Courses, and 9 credits from the General Electives, selected after consultation with the Asian Studies program advisor. In addition to the core and elective courses, 16 credits of an Asian language are required for graduation.

Minor

For an Asian Studies Minor, students must complete a minimum of 12 credits selected from the Core Courses. The remaining 8 credits must be chosen from the General Electives or from language courses for the minor.

Core Courses

BIS 4550 (CI) Principles of International Business Communications (Sp).....	3
ECON 5400 International and Development Economics (F).....	4
ENGL 3320 Period Studies in World Literature (when syllabus includes Asian literature) (F, Sp).....	3
ENGL 4360 Studies in Drama/Film (when course subtitle is Asia) (Sp).....	3
GEOG 4200 (CI) Regional Geography (when region covered is Asian) (F, Sp, Su).....	3
HIST 1060 (BHU) Introduction to Islamic Civilization.....	3
HIST 3460 Comparative Asian History.....	3
HIST 3480 History of China.....	3
PHIL 3710 Philosophies of East Asia (F).....	3
PHIL 4900 Special Topics (when syllabus includes Asian philosophies) (F, Sp).....	3
POLS 3230 Middle Eastern Government and Politics (F).....	3
POLS 3250 (DSS) Chinese Government and Politics (F).....	3
POLS 4220 (CI) Ethnic Conflict and Cooperation (when syllabus includes Asian Conflicts) (Sp).....	3

POLS 4260 Southeast Asian Government and Politics (Sp).....	3
POLS 4470 Foreign Policy in the Pacific (Sp).....	3
SOC 4710 Asian Societies (Sp).....	3
SOC 4730 Women in International Development (Sp).....	3

General Electives

(required minimum of 9 credits):

ANTH 1010 (BSS) Cultural Anthropology (F, Sp).....	3
ANTH 2100 (BSS) Peoples of the Contemporary World (Sp).....	3
ANTH 3160 (DSS) Anthropology of Religion (F).....	3
ANTH/LING 4100 The Study of Language (F, Sp).....	3
ANTH 5100 (DSS) Anthropology of Sex and Gender (Sp).....	3
ANTH 5160 (DSS) Cities and Development (Sp).....	3
BA 4300 International Finance (F, Sp).....	3
BA 4590 Global Marketing Strategy (F, Sp).....	3
ECON 3400 (DSS) International Economics for Business (F, Sp, Su) ..	3
ECON 5120 Economics of Russia and Eastern Europe, 9th Century to 21st Century (F).....	3
ECON 5150 (DSS) Comparative Economic Systems (Sp).....	3
ECON 5850 Regional and Community Economic Development (F).....	3
GEOG 1030 (BSS) World Regional Geography (F, Sp).....	3
GEOG 2030 (BSS) Human Geography (F).....	3
GEOG 2130 Population Geography (Sp).....	3
GEOG 3430 Political Geography (Sp).....	3
NR 1010 (BSS) Humans and the Changing Global Environment (F, Sp).....	3
PLSC 4300 World Food Crops and Cropping Systems: The Plants That Feed Us (Sp).....	3
POLS 2100 Introduction to International Politics (F, Sp).....	3
POLS 2200 (BSS) Comparative Politics (F, Sp).....	3
POLS 5200 Global Environment (F).....	3
POLS 5440 (DSS) Gender and World Politics (Sp).....	3
SOC 3200 (DSS) Population and Society (F, Sp).....	3
SOC 3600 Sociology of Urban Places (F).....	3
SOC/GEOG 5650 (DSS) Developing Societies (F).....	3
SOC 6310 Sociology of Work and Occupations (Sp).....	3

Asian Languages

Descriptions of Asian language courses can be found in the *Course Descriptions* section of this catalog.

Department of Biological and Irrigation Engineering

Department Head: Ronald C. Sims

Location: Engineering 402G

Phone: (435) 797-2785

FAX: (435) 797-1248

E-mail: bieusu@cc.usu.edu

WWW: <http://www.engineering.usu.edu/bie>

Undergraduate Advising:

Engineering Advising Center, Engineering 314A, (435) 797-2705,
sophie@engineering.usu.edu, kathy@engineering.usu.edu,
ronnie@engineering.usu.edu

Degrees offered:

Bachelor of Science (BS), Master of Science (MS), and Doctor of Philosophy (PhD) in Biological Engineering; MS and PhD in Irrigation Engineering

Undergraduate options: BS—Bioprocess; Bioenvironmental; Biomedical; and Soil and Water Resource Systems Engineering

Graduate specializations: MS, PhD—Agricultural Hydrology; Crop Water-Yield Analysis; Drainage; Evapotranspiration; Groundwater Management and Simulation; Irrigation Conveyance and Control Structures; Irrigation Project Planning, Design, and Operation and Management; Molecular Biology; On-Farm Water Management; Remote Sensing and Geographical Information Systems; Surface, Sprinkle, and Trickle Irrigation Methods

Mission

The mission of the Department of Biological and Irrigation Engineering (BIE) is to teach students preparing to become biological engineers how to apply engineering principles and the knowledge of biological sciences to the design, control, and analysis of biological-engineered systems and to solutions of biotechnology problems. The department also prepares students for entry into other professions, including biomedical engineering, environmental engineering, medicine, and law.

Scope and Objectives

The scope of the Biological Engineering Program involves engaging students to learn to manipulate biological materials for useful purposes, to understand the biological literature, and to be able to communicate with biological scientists. Students first learn to integrate biological sciences with conventional studies in mathematics and chemistry. These skills are broadened with a liberal exposure to humanities and social sciences, then sharpened with the study of engineering topics that develop practical problem-solving abilities; expand a sensitivity to the economic, social, and legal dimensions of technical problems; provide an understanding of ethics and professional responsibility; and stimulate a desire for life-long learning. The scope involves applications in engineered biological systems, from nanoscale to watershed scale, as well as engineered life-support systems in above-earth and planetary space environments.

The objectives of the Biological Engineering Program are to:

1. Develop practical problem-solving and communication abilities that will contribute to biological engineering practice, advance knowledge, and contribute to society;
2. Expand a professional sensitivity to the economic, social, and legal dimensions of technical problems, in order that engineering solutions are more holistic and applicable; and
3. Stimulate a desire for life-long learning and adaptation as one means of extending engineering knowledge.

Outcomes

Biological Engineering Program outcomes are aligned with the program outcomes of all academic engineering programs in the U.S. that are provided by the Accreditation Board for Engineering and Technology/Engineering Accreditation Commission (ABET/EAC). Six specific outcomes are identified below.

1. Students have proven themselves to be proficient in mathematics, the sciences, and engineering.
2. Students have shown a capacity for investigation and experimentation, including the analysis and interpretation of data, as well as the ability to design an effective biological or irrigation system.
3. Students have exercised their engineering skills as part of a multi-disciplinary group, and have demonstrated the capability to communicate verbally, in writing, graphically, and through engineering media.
4. Students have demonstrated the ability to solve engineering analysis and design problems, utilizing both fundamental engineering principles and modern engineering technology and tools.
5. Students have demonstrated an understanding of the standards of professional conduct and ethical responsibility, in addition to understanding the role that an engineer plays in modern global society.
6. Students have manifested recognition of and commitment to the need for life-long learning as a professional, and have broadened the scope of their interests beyond engineering to include an awareness of the world around them.

Assessment and Evaluation

The BIE Department is committed to an assessment process aimed at evaluating the effectiveness of BIE programs in preparing graduates as productive professionals. The foundation of departmental assessment is the undergraduate accreditation by the Engineering Accreditation Commission (EAC) of the Accreditation Board for Engineering and Technology (ABET).

The continuing improvement processes that are documented and implemented annually as part of the accreditation activities in support of the EAC/ABET requirements provide for formal and external review of the Biological Engineering Bachelor of Science program. Internal assessment and evaluation is formally conducted annually through BIE Department committees including: (1) the Curriculum Committee, and (2) the ABET Committee. This assessment and evaluation ensures that the USU program meets an overall objective and structure consistent with similar programs in the U.S. and Canada.

The biological engineering program is continuously improved through integrating the results of this formal assessment with the day-to-day assessments obtained from both students and faculty. To ensure the overall quality of the program, the department conducts several specific assessments. These are:

1. Annual faculty self-assessment survey
2. Fundamentals of Engineering Examination performances

Department of Biological and Irrigation Engineering

3. Biological and Irrigation Engineering Advisory Board activities, including employer responses and board reviews
4. Alumni survey
5. Graduating student exit interviews
6. Teaching evaluations

Undergraduate Programs

General biological engineering concepts include the properties of biological materials, electronics and bio-instrumentation, computer use and programming, engineering mechanics, thermodynamics, computer-aided drafting, bio-environmental transport phenomena, and fluid mechanics.

Students gain a strong foundation in biological, chemical, and physical sciences. Each student then selects an option within the field, based on personal interest. These areas of study are tailored for each student with 21 semester credits of technical electives and one-on-one academic advisement with a member of the faculty. Design is a major theme of both the student's general coursework and specialization, with most courses including open-ended design problems. The entire design experience is brought together in a capstone design course.

The Biological Engineering Program is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (EAC/ABET).

Requirements

Admission and Graduation Requirements

The student who is majoring in or planning to major in Biological Engineering needs to be aware of the College of Engineering requirements concerning admission to the college, pre-engineering, admission to the professional engineering program, general education, and other academic requirements. Additional information concerning these items is given in the College of Engineering requirements on pages 111-113. It is the responsibility of the student to be aware of these rules and regulations.

Biological Engineering Curriculum

Biological Engineering is divided into a preprofessional and a professional program involving either a four-year or a five-year schedule that will satisfy the requirements for a BS degree in Biological Engineering. Students receiving credit from the College Level Examination Program (CLEP) or from Advanced Placement (AP) may complete a BS degree program in less than four years. The academic work, particularly in the junior and senior years, is supplemented by hands-on laboratories which are required as part of the coursework. Modification in the program to meet special needs and priorities of a student may be obtained with the approval of the department head and advisor.

Preprofessional Program:

BIE 1880 Engineering Quantification of Biological Processes (Sp)	3
BIE 2330 Engineering Properties of Biological Materials (Sp)	3
CHEM 1210 Principles of Chemistry I (F,Sp)	4
CHEM 1230 Chemical Principles Laboratory I (F,Sp)	1
CHEM 2300 Principles of Organic Chemistry (F)	3
CHEM 2330 Organic Chemistry Laboratory I (F)	1
ENGR 1010 Introduction to Engineering Design (F)	2

ENGR 2000 Engineering Mechanics Statics (F,Sp)	2
ENGR 2020 Engineering Mechanics Dynamics (F,Sp)	3
ENGR 2200 Engineering Numerical Methods I (F)	3
BIOL 1210 (BLS)¹ Biology I (F)	4
ENGL 2010 (CL) Intermediate Writing: Research Writing in a Persuasive Mode (F,Sp,Su)	3
ETE 2270 Computer Engineering Drafting (F,Sp,Su)	2
MAE 2400 Thermodynamics I (Sp,Su)	3
MATH 1210 (QL) Calculus I (F,Sp,Su)	4
MATH 1220 (QL) Calculus II (F,Sp,Su)	4
MATH 2250 (QI) Linear Algebra and Differential Equations (F,Sp,Su) ..	4
PHYX 2200 Elements of Mechanics	2
Communications Literacy	3

Professional Program:

BIE 3000 Instrumentation for Biological Systems (Sp)	2
BIE 3200 Introduction to Unit Operations in Biological Engineering (F)	3
BIE 3670 Transport Phenomena in Bio-Environmental Systems (Sp) ..	3
BIE 3870 Biological Engineering Design I (F,Sp,Su)	1
BIE 4880 (CI) Biological Engineering Design II (F,Sp,Su)	3
BIE 4890 (CI) Biological Engineering Design III (F,Sp,Su)	3
BIOL 3300 (BLS)¹ General Microbiology (F,Sp)	4
BIOL 5020 (QI) Modeling Biological Systems (F)	3
CEE 3500 Civil and Environmental Engineering Fluid Mechanics (F,Sp)	3
CHEM 3700 Introductory Biochemistry (Sp)	3
CHEM 3710 Introductory Biochemistry Laboratory (Sp)	1
STAT 3000 (QI) Statistics for Scientists (F,Sp)	3
ETE 2300 (QI) Electronic Fundamentals (F,Su)	4
Biological Engineering Electives	6-21
Engineering Electives (0-15 cr) (9-21 cr total for Biological Engineering Electives <i>and</i> Engineering Electives combined)	9-21
Technical Electives (0-12 cr) (21 cr total for Biological Engineering Electives, Engineering Electives, <i>and</i> Technical Electives combined)	0-12
University Studies (18 credits)	18

Biological Engineering Required Coursework

Suggested Semester Schedule

Preengineering: Freshman and Sophomore

Freshman Year (32 credits)

Fall Semester (15 credits)

BIOL 1210 (BLS)^{1,3} Biology I	4
CHEM 1210³ Principles of Chemistry I	4
CHEM 1230³ Chemical Principles Laboratory I	1
ENGR 1010³ Introduction to Engineering Design	2
MATH 1210 (QL)³ Calculus I	4

Spring Semester (17 credits)

BIE 1880³ Engineering Quantification of Biological Processes	3
ETE 2270³ Computer Engineering Drafting	2
MATH 1220 (QL)³ Calculus II	4
PHYX 2200³ Elements of Mechanics	2
University Studies Breadth Courses	6

Sophomore Year (32 credits)

Fall Semester (16 credits)

CHEM 2300³ Principles of Organic Chemistry	3
CHEM 2330³ Organic Chemistry Laboratory I	1
ENGR 2000³ Engineering Mechanics Statics	2
ENGR 2200³ Engineering Numerical Methods I	3
MATH 2250 (QI)³ Linear Algebra and Differential Equations	4
University Studies Breadth Course	3

Department of Biological and Irrigation Engineering

Spring Semester (16 credits)

BIE 2330 ³ Engineering Properties of Biological Materials.....	3
BIOL 3300 (BLS) ¹ General Microbiology	4
ENGL 2010 (CL) ³ Intermediate Writing: Research Writing in a Persuasive Mode.....	3
ENGR 2020 ³ Engineering Mechanics Dynamics.....	3
MAE 2400 ³ Thermodynamics I.....	3

Professional Engineering: Junior and Senior

Junior Year (32 credits)

Fall Semester (16 credits)

BIE 3200 Introduction to Unit Operations in Biological Engineering	3
CEE 3500 Civil and Environmental Engineering Fluid Mechanics.....	3
ETE 2300 (QI) Electronic Fundamentals.....	4
STAT 3000 (QI) Statistics for Scientists	3
Technical Elective Course ²	3

Spring Semester (16 credits)

BIE 3000 Instrumentation for Biological Systems	2
BIE 3670 Transport Phenomena in Bio-Environmental Systems.....	3
BIE 3870 Biological Engineering Design I.....	1
CHEM 3700 Introductory Biochemistry	3
CHEM 3710 Introductory Biochemistry Laboratory	1
Technical Elective Course ²	3
University Studies Breadth Course	3

Senior Year (32-34 credits)

Fall Semester (15-16 credits)

BIE 4880 (CI) Biological Engineering Design II.....	3
BIOL 5020 (QI) Modeling Biological Systems	3
University Studies Depth Course (DHA)	2-3
Technical Elective Courses ²	7

Spring Semester (17-18 credits)

BIE 4890 (CI) Biological Engineering Design III.....	3
Technical Elective Courses ²	8
University Studies Breadth Course (BPS).....	3-4
University Studies Depth Course (DSS).....	3

Technical Elective Courses (select 21 or more credits)

Students must select 9-21 credits from the **Biological Engineering Electives** and **Engineering Electives** categories.

Biological Engineering Electives (select 6-21 credits)

BIE 5010 Principles of Irrigation Engineering (F)	3
BIE 5110 Sprinkle and Trickle Irrigation (F).....	4
BIE 5150 Surface Irrigation Design (Sp)	3
BIE 5250 Remote Sensing of Land Surfaces (Sp).....	4
BIE 5300 Irrigation Conveyance and Control Systems (F)	3
BIE 5350 Drainage and Water Quality Engineering (Sp)	3
BIE 5520 Irrigation Project Operation and Maintenance (Sp).....	3
BIE 5550 Groundwater Systems Engineering I (F)	3
BIE 5610 Food and Bioprocess Engineering (F).....	3
BIE 5680 Soil-based Waste Management (Sp).....	2
BIE 5810 Biochemical Engineering (F)	3
BIE 5830 Management and Utilization of Biological Solids and Wastewater (F)	3
BIE 5850 Biomaterials Engineering (F).....	3
BIE 5890 Tissue Engineering (Sp).....	3
BIE 5910 Introduction to Biosensors (F)	3

Engineering Electives (select 0-15 credits)

CEE 3430 Engineering Hydrology (Sp).....	3
CEE 3510 Civil and Environmental Engineering Hydraulics (F,Sp).....	3
CEE 3640 Water and Wastewater Engineering (Sp).....	4

CEE 4200 Engineering Economics (F).....	2
CEE 5430 Groundwater Engineering (F)	3
CEE 5680 Soil-based Waste Management (Sp)	2
MAE 5620 Manufacturing Automation (F)	3

Technical Electives (select 0-12 credits)

AV 4200 Composite Manufacturing Processes and Repair (Sp).....	3
AWER 4490 Small Watershed Hydrology (F).....	4
AWER 4500 Freshwater Ecology (Sp)	3
AWER 5660 Watershed and Stream Restoration (Sp).....	2
BIE 4250 Cooperative Practice (F,Sp,Su)	3
BIOL 2000 Human Physiology (F,Sp,Su)	4
BIOL 2010 Human Anatomy (Sp,Su)	4
BIOL 3100 (CI) Bioethics (Sp).....	3
BIOL 3200 (QI) Principles of Genetics (F,Sp,Su)	4
BIOL 5160 Methods in Biotechnology: Cell Culture (Sp).....	3
BIOL 5210 Cell Biology (F)	3
BIOL 5230 Developmental Biology (Sp)	3
BIOL 5240 Methods in Biotechnology: Protein Purification Techniques (Sp)	3
BIOL 5260 Methods in Biotechnology: Molecular Cloning (F)	3
BIOL 5620 Medical Physiology (Sp)	3
CEE 2240 Engineering Surveying (F,Su)	3
CEE 3610 Environmental Management (F)	3
CEE 3870 Professional/Technical Writing in Civil and Environmental Engineering (F).....	2
CHEM 2320 Organic Chemistry II (Sp)	4
CHEM 2340 Organic Chemistry Laboratory II (Sp)	1
CHEM 3070 (QI) Physical Chemistry (Sp)	3
ECE 2410 Electrical Circuits (F,Sp)	4
ECE 2530 Digital Circuits (F,Sp)	4
ENGR 2040 Strength of Materials (F,Sp)	2
ETE 3030 Computer-Integrated Manufacturing Systems (Sp).....	3
MAE 2060 Material Science (F, Sp)	3
MAE 2600 Manufacturing Processes (Sp)	3
NFS 3100 (QI) Sensory Evaluation of Food (Sp)	3
NFS 4020 Advanced Nutrition (F)	3
NFS 5110 (CI) Food Microbiology (Sp)	4
PHYX 2110 The Physics of Living Systems I	4
PHYX 2120 (BPS) The Physics of Living Systems II	4
PHYX 2210 (QI) General Physics—Science and Engineering I.....	4
PHYX 2220 (BPS/QI) General Physics—Science and Engineering II ..	4
SOIL 3000 Fundamentals of Soil Science (F, Sp).....	4
SOIL 5650 Applied Soil Physics (F)	3

Other technical courses may be accepted with prior written approval from the Department of Biological and Irrigation Engineering.

Suggested Semester Schedule for Premedical Program

It is possible for students to combine premedical requirements with requirements for the Biological Engineering major. Some of the premedical requirements add to the total amount of credits required. This combination may be completed within five years, if the student is very diligent. Medical schools *do not* accept AP, CLEP, or ACT scores toward fulfillment of English Composition, Chemistry, or Biology requirements. The following schedule is designed to satisfy the requirements without time conflicts. Students who must deviate from this schedule should be sure to meet often with a College of Engineering advisor.

Preengineering: First Three Years

First Year (31 credits)

Fall Semester (15 credits)

BIOL 1210 ^{1,3} Biology I.....	4
CHEM 1210 ³ Principles of Chemistry I	4

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CHEM 1230 ³ Chemical Principles Laboratory I.....	1
ENGR 1010 ³ Introduction to Engineering Design.....	2
MATH 1210 (QL) ³ Calculus I.....	4

Spring Semester (16 credits)

BIE 1880 ³ Engineering Quantification of Biological Processes.....	3
BIOL 1220 (BLS) Biology II.....	4
CHEM 1220 (BPS) Principles of Chemistry II.....	4
CHEM 1240 Chemical Principles Laboratory II.....	1
MATH 1220 (QL) ³ Calculus II.....	4

Second Year (31 credits)

Fall Semester (15 credits)

PHYX 2210 (QI) ³ General Physics—Science and Engineering I.....	4
MATH 2250 (QI) ³ Linear Algebra and Differential Equations.....	4
ENGL 1010 (CL) ³ Introduction to Writing: Academic Prose.....	3
ENGR 2000 ³ Engineering Mechanics Statistics.....	2
ETE 2270 ³ Computer Engineering Drafting.....	2

Spring Semester (16 credits)

PHYX 2220 (BPS/QI) General Physics—Science and Engineering II ..	4
ENGL 2010 (CL) ³ Intermediate Writing: Research Writing in a Persuasive Mode.....	3
BIE 2330 ³ Engineering Properties of Biological Materials.....	3
ENGR 2020 ³ Engineering Mechanics Dynamics.....	3
University Studies Breadth American Institutions (BAI) Course.....	3

Third Year (31 credits)

Fall Semester (15 credits)

ENGR 2200 ³ Engineering Numerical Methods I.....	3
CHEM 2310 ³ Organic Chemistry I.....	4
CHEM 2330 Organic Chemistry Laboratory I.....	1
BIOL 2000 Human Physiology.....	4
University Studies Breadth Humanities (BHU) Course.....	3

Spring Semester (16 credits)

CHEM 2320 Organic Chemistry II.....	4
CHEM 2340 Organic Chemistry Laboratory II.....	1
BIOL 2010 Human Anatomy.....	4
BIOL 3200 (QI) Principles of Genetics.....	4
MAE 2400 ³ Thermodynamics I.....	3

Professional Engineering: Junior and Senior Years

Junior Year (31 credits)

Fall Semester (16 credits)

BIE 3200 Introduction to Unit Operations in Biological Engineering.....	3
CEE 3500 Civil and Environmental Engineering Fluid Mechanics.....	3
ETE 2300 (QI) Electronic Fundamentals.....	4
BIOL 5210 Cell Biology.....	3
University Studies Breadth Social Sciences (BSS) Course.....	3

Spring Semester (15 credits)

BIOL 3300 (BLS) ^{1,3} General Microbiology.....	4
BIE 3670 Transport Phenomena in Bio-Environmental Systems.....	3
BIE 3870 Biological Engineering Design I.....	1
CHEM 3700 Introductory Biochemistry.....	3
CHEM 3710 Introductory Biochemistry Laboratory.....	1
University Studies Breadth Creative Arts (BCA) Course.....	3

Students should plan to take the MCAT during summer prior to their final year.

Senior Year (29 credits)

Fall Semester (15 credits)

BIE 4880 (CI) Biological Engineering Design II.....	3
BIE 5850 Biomaterials Engineering.....	3

BIOL 5020 (QI) Modeling Biological Systems.....	3
STAT 3000 (QI) Statistics for Scientists.....	3
BIE Elective.....	3

Spring Semester (14 credits)

BIE 3000 Instrumentation for Biological Systems.....	2
BIE 4890 (CI) Biological Engineering Design III.....	3
Engineering Elective.....	3
University Studies Depth Humanities and Creative Arts (DHA) Course.....	3
University Studies Depth Social Sciences (DSS) Course.....	3

¹The Breadth Life Sciences (BLS) area in the University Studies Program is satisfied by the combination of BIOL 1210 and 3300.

²To emphasize irrigation, bioprocesses, premedical, etc., contact department for suggested technical electives.

³This course is required for admission to the Professional Engineering Program (PEP).

Departmental Honors

Students who would like to experience greater academic depth within their major are encouraged to enroll in departmental honors. Through original, independent work, Honors students enjoy the benefits of close supervision and mentoring, as they work one-on-one with faculty in select upper-division departmental courses. Honors students also complete a senior project, which provides another opportunity to collaborate with faculty on a problem that is significant, both personally and in the student's discipline. Participating in departmental honors enhances students' chances for obtaining fellowships and admission to graduate school. Minimum GPA requirements for participation in departmental honors vary by department, but usually fall within the range of 3.30-3.50. Students may enter the Honors Program at almost any stage in their academic career, including at the junior (and sometimes senior) level. The campus-wide Honors Program, which is open to all qualified students regardless of major, offers a rich array of cultural and social activities, special classes, and the benefit of Honors early registration. Interested students should contact the Honors Program, Merrill Library 374, (435) 797-2715, honors@cc.usu.edu. Additional information can be found online at: <http://www.usu.edu/honors/>

Additional Information

For more information about the Bachelor of Science requirements and the sequence in which courses should be taken, see major requirement sheet, available from the Biological and Irrigation Engineering Department, or online at: <http://www.usu.edu/ats/majorsheets/>

Financial Support

Scholarships, assistantships, grants-in-aid, and work-study programs are available through the University. In addition, the department employs students to assist in engineering research and development. Cooperative education and industrial employment opportunities for students are coordinated by the University Placement Office and by the BIE Department.

Concurrent BS/Master's Program

The concurrent BS/Master's program allows engineering students to begin taking graduate-level classes during their senior year. This permits them to complete requirements for *both* the BS degree *and* the master's degree concurrently during two years. Students in this program have a greater selection of graduate courses, since many

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graduate courses are taught during alternate years. In addition, the student's senior design project could be applicable to a graduate design project or thesis. After completing their BS degree, students in the program can earn a master's degree in only one additional year. Both the BS and the master's degree can generally be earned with 150 total credits, although students should note that a Plan C MS requires 3 extra credits. Finally, students with a master's degree can expect a much higher starting salary following graduation. (For more information, see *College of Engineering* section of this catalog, pages 113-114.)

Graduate Programs

Admission Requirements

See general admission requirements identified in this catalog. Admission committees also consider experience, undergraduate record and curriculum, and formal recommendations. A student without an undergraduate engineering background will be required to complete selected undergraduate courses prior to or concurrently with enrollment in graduate courses.

Prerequisites for Matriculation

Students who are admitted provisionally or who have been changed from matriculated to probationary matriculated status will have their records reviewed by a faculty committee when they have completed 12 credits of coursework (among which must be formal engineering courses) or at the end of their second semester at USU. Those students who have earned a 3.0 GPA at that time and desire to be matriculated may apply to the department to have their status changed. If they meet all other academic requirements of the School of Graduate Studies and the department, they will be matriculated and admitted to the degree program. When a student is admitted as a degree candidate, the committee may allow up to 12 credits taken while on nonmatriculated status to be transferred. Nonmatriculated students may continue to study at USU but without degree candidate status. At the end of their studies, nondegree students are granted a Certificate of Completion.

Prerequisite Requirements

All students must have had **formal** courses in engineering and computer programming, as well as at least one year of calculus. Students without this background can satisfy these requirements by taking the appropriate undergraduate courses at USU. An additional year of calculus (MATH 1210, 1220, and 2250, or equivalent) is required for the MS degree in Irrigation Engineering and for all PhD programs. These background courses will not be counted toward the degree credit requirements.

MS in Biological Engineering and in Irrigation Engineering

Students must have a BS from an ABET-accredited engineering program in the U.S. or its equivalent in their home countries or must take the make-up coursework required for a BS in engineering at USU. It is assumed that the bachelor's degree mathematical training includes courses in calculus, linear analysis, and differential equations.

Three MS options are available: research (Plan A), technical practice (Plan B), and training/extension (Plan C).

Research Option

Students wishing to gain experience in research may select the research option, particularly if they have a long-term goal of PhD study. The minimum requirements for this option are 30 credits, of which 8 may be awarded for the thesis.

Technical Practice Option

Some students may not be interested in pursuing a PhD degree or in doing the research necessary for a thesis. For such students, the technical practice (Plan B) option is offered. The requirements for the degree are similar to those for the research option, with the exception of the thesis. The 8 thesis credits are replaced by 4 credits for a significant engineering report or design project and 4 additional credits of coursework. The minimum course requirement for the technical practice option is 30 approved graduate credits.

Training/Extension Option

Students expecting to terminate their graduate studies at the MS level and wishing to develop an emphasis in the training and/or extension fields of biological engineering or irrigation engineering, may choose the training/extension option (Plan C). The same engineering BS or equivalent requirements noted under the Plan A option apply. The minimum requirements for this degree are 30 approved graduate credits. No report or thesis is required. The degree requirements under this option can be met by taking courses.

Doctor of Philosophy

Two PhD programs are offered in the department: (1) **Biological Engineering** and (2) **Irrigation Engineering**. Students who have completed an MS with a thesis (Plan A or equivalent) in an engineering discipline are eligible to apply for admission to a PhD program. Admission will be based on the students' prior academic records and, if they are graduates of USU, the recommendations of their graduate committees. It is assumed that students are adequately prepared in mathematics and engineering design courses to compete at the PhD level. If such is not the case, a program of courses to make up the deficiency will be required.

In addition to any prescribed review courses and seminars, the minimum requirements for a PhD program include 60 credits of approved graduate courses beyond a master's degree, satisfactory completion of comprehensive examinations or submission of an approved manuscript to a refereed archival journal, and the writing of a dissertation based on an original research project. The degree requirements beyond a master's degree can be met by taking courses in engineering design, synthesis, and systems; mathematics; and related science.

Research

Graduate research projects in the BIE Department encompass two broad options: biological engineering and irrigation engineering. Specific research projects in the biological engineering option include tissue and biomedical engineering related to heart stents, biosensor design and development for biomedical and bioenvironmental applications (genetic probes), microbial fermentations, biorefining (production of biofuels and bioplastics from biological feedstocks), nanobiotechnology (quantum dots), biophotonics (interactions of light with biological materials), and land-based bioenvironmental sustainable systems (land application of industrial and municipal residuals for recycling, vegetative growth, soil improvement, and groundwater protection).

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Food engineering represents an area of emphasis under the biological engineering option. Land application of food processing wastes, extrusion of dairy-based food, multi-stage anaerobic digestion of biological materials, functional properties of foods, and biological detoxification of metals are some of the research topics supported in food engineering.

In the irrigation engineering area, USU has attained worldwide prestige through the successful professional contributions of its graduates during a period of 80 years. The BIE Department is substantially involved in overseas research and training activities, for example in the Dominican Republic, Armenia, and Tatarstan, concerned with managing irrigation systems, on-farm water management, water resource development, and soil assimilation and recycling of industrial residues. Specific research projects in the irrigation and drainage engineering option include hydraulics of surface irrigation, consumptive use, return flow quantity and quality of irrigation waters, transient flow in tile drainage systems, drain envelopes, sprinkler irrigation, trickle irrigation, crop production and water requirements, salt movement, regional groundwater modeling for optimizing sustainable yield, conveyance system modeling and control, and remote sensing.

Financial Assistance

The large and diverse departmental research programs make it possible to offer graduate financial support in the form of research assistantships, traineeships, and teaching assistantships for qualified students. Research assistantships are provided by the BIE Department and by individual research projects. Teaching assistantships are provided by the School of Graduate Studies and by the College of Engineering. Traineeships and research assistantships carry tuition waivers. It is the goal of the BIE Department to provide research and/or teaching support for all qualified students.

Additional Information

Two guides are available from the department to assist students: (1) *Report, Thesis, and Dissertation Format Guidelines and Policies*, and (2) *Policies and Procedures for Graduate Study*.

Biological and Irrigation Engineering Faculty

Professors

Conly L. Hansen, food engineering
Thomas B. Hardy, natural systems
Robert W. Hill, irrigation and water resource extension
Christopher M. U. Neale, remote sensing
Richard C. Peralta, groundwater
Linda S. Powers, bioprocess engineering
Ronald C. Sims, biological process engineering
Wynn R. Walker, surface irrigation, Associate Dean of College of Engineering

Research Professors

Darwin L. Sorensen, soil microbiology
L. Humberto Yap-Salinas, drainage

Adjunct Professors

Richard Allen, irrigation
Anne J. Anderson, plant root-microbe interactions
Lawrence E. Hipps, biometeorology
Bart C. Weimer, microbiology, Director of Center for Integrated BioSystems

Professors Emeritus

George H. Hargreaves, crop water requirements
Jack Keller, sprinkle and drip irrigation
Gaylord V. Skogerboe, waterlogging and salinity
Glen E. Stringham, surface irrigation
Lyman S. Willardson, drainage

Associate Professor

Gary P. Merkley, conveyance systems

Research Associate Professors

Joan E. McLean, soil chemistry
Judith L. Sims, soil biology

Adjunct Associate Professors

Michael J. McFarland, biosolids
Daryll B. DeWald, cell biology, Associate Director of Center for Integrated BioSystems

Associate Professor Emeritus

Edwin C. Olsen III, international irrigation, water management

Assistant Professors

David W. Britt, biomedical engineering
Kytai T. Nguyen, biomedical engineering
Anhong Zhou, nanobiotechnology

Research Assistant Professor

Babukannan Kasilingam, canal hydraulics

Adjunct Assistant Professors

David G. Chandler, soil processes
Andrew A. Keller, irrigation
Paul D. Schreuders, biomedical engineering

Adjunct Research Assistant Professors

Hui Fang Dou, electrical engineering
Arnulfo González-Meza, irrigation system transfer
Scott B. Jones, soil physics
Charles D. Miller, biology

Research Assistant Professor Emeritus

R. Kern Stutler, irrigation structures

Principal Lecturer

Timothy A. Taylor, bioprocess engineering

Course Descriptions

Biological and Irrigation Engineering (BIE), pages 464-466

Department Head: Jon Y. Takemoto
Location: Biology-Natural Resources 121
Phone: (435) 797-2485
FAX: (435) 797-1575
E-mail: undergrad_info@biology.usu.edu
or graduate_info@biology.usu.edu
WWW: <http://www.biology.usu.edu/>

Associate Head:
Timothy A. Gilbertson, Biology-Natural Resources 327,
(435) 797-7314, tag@biology.usu.edu

Director of Undergraduate Studies:
Dennis L. Welker, Biology-Natural Resources 101, (435) 797-3552,
dennis.welker@usu.edu

Director of Graduate Studies:
Peter C. Ruben, Biology-Natural Resources 343, (435) 797-2490,
pruben@biology.usu.edu

Biology Advisor:
Linda M. Woertendyke, Biology-Natural Resources 101,
(435) 797-2577, lindaw@biology.usu.edu

Advisor for Prehealth Professions Programs:
D. M. Andy Anderson, Veterinary Science and Bacteriology 231,
(435) 797-1913, andy@biology.usu.edu

Advisor for Public Health Major:
David Wallace, Biology-Natural Resources 333, (435) 797-7155,
dwallace@biology.usu.edu

Degrees offered: Bachelor of Science (BS), Bachelor of Arts (BA), Master of Science (MS), and Doctor of Philosophy (PhD) in Biology; BS and BA in Composite Teaching—Biological Science; BS in Public Health; MS and PhD in Ecology; MS and PhD in Toxicology is available through the Interdepartmental Program in Toxicology.

Undergraduate emphases: *Biology BS, BA*—Biology, Cellular/Molecular, Ecology/Biodiversity, Environmental; *Public Health BS*—Industrial Hygiene, Environmental Health, Public Health Education

Undergraduate Programs

Learning Objectives

Biology

The Department of Biology offers programs leading to a Bachelor of Science or Bachelor of Arts degree. Majors will complete a core of courses which provide an understanding of biological principles. Upper-division courses provide integration, in-depth study, and an opportunity for specialization within the different degree emphases. Additional coursework in chemistry, physics, statistics, and mathematics provides knowledge and analytical skills in these important related fields. Most biology degrees provide a foundation for graduate work. Biology majors can add a minor area of study, such as business or chemistry, to enhance their employment opportunities.

Prehealth Professions Programs

The Department of Biology supervises premedical, pre dental, and other prehealth professions programs. These programs satisfy entrance requirements for most medical and dental schools in the United States and Canada and are recognized for the high-quality preprofessional preparation they provide. After four years, the student

receives a BS degree in Biology or another major. **Advisor:** D. M. Andy Anderson, Veterinary Science and Bacteriology 231.

Composite Teaching—Biological Science

This major combines content training in biology and related fields (including chemistry, physics, geology, mathematics, and statistics) with education courses. Graduates are licensed to teach at the secondary level. **Advisor:** Richard J. Mueller, Eccles Science Learning Center 245.

Public Health

The Department of Biology offers preprofessional training in public health. Individuals completing the BS degree have employment opportunities in such areas as environmental health, industrial hygiene, public health education, administration, nursing, nutrition, mental health, and social work. **Advisor:** David O. Wallace, Biology-Natural Resources 333.

The Department Head, the Director of Undergraduate Studies, and advisors in the Department of Biology are available to provide undergraduate majors with additional information regarding specific programs and career opportunities. The Biology Advising Center and the Director of Undergraduate Studies are located in BNR 101. Program requirements, advising information, and an “**Ask an Advisor**” e-mail service are on the Department of Biology web page at: <http://www.biology.usu.edu>

Students with majors in the Department of Biology should consult with their advisors regularly as they plan their course of study. Students have the responsibility to keep themselves aware of major requirements and course prerequisites. General requirements, specific course offerings, and the semesters that courses are taught may change.

Mathematics is an important and required skill to enhance one's success in the sciences. Proper course level placement in mathematics at the beginning of the degree program is essential. Students should consult with an advisor to determine the appropriate level to begin their mathematics studies for meeting requirements and completion of their major. For detailed information, obtain an official Major Requirement Sheet from the Biology Advising Center or online at: <http://www.usu.edu/ats/majorsheets/>

Assessment

The primary mission of the Department of Biology is to discover and advance knowledge in the biological sciences, and to make that knowledge available to students through a diverse set of educational experiences. To achieve this, three specific areas are being targeted: (1) A core program in the life sciences is aimed at providing the skills and knowledge base needed for a wide variety of employment and educational opportunities in biological and biotechnology fields; (2) a premedical, pre dental, and prehealth program has the specific goal of guiding students with respect to opportunities in the health professions; and (3) a public health program provides pre-professional training in such subjects as environmental health, industrial hygiene, and public health education. For full details about Program Learning Objectives, Undergraduate Program Assessment, Data-based Decisions, and more, go to <http://www.biology.usu.edu>

Undergraduate Research in Biology

The Department of Biology offers a broad array of undergraduate research opportunities. Undergraduate research allows students to

Department of Biology

have a real-life experience in a faculty research lab. Many students publish their research in scientific journals and present their research at national scientific meetings. Students may do undergraduate research work under the supervision of selected faculty members. To receive academic credit, a student must enroll in BIOL 5800, Undergraduate Research. Students doing Honors in Biology do undergraduate research and write a bachelor's thesis.

For complete information about undergraduate research, contact Linda Woertendyke, Biology Advisor, at lindaw@biology.usu.edu or (435) 797-2577.

Requirements

University Requirements

Students are responsible for meeting all University requirements for total credits, upper-division credits, credits of C- or better, and the University Studies Program. (See pages 46-58 in this catalog.)

College of Science Requirements

All college requirements are met by completing the departmental degree requirements; no additional coursework is required.

Departmental Admission Requirements

New freshmen admitted to USU in good standing qualify for admission to the Biology and Public Health majors. Transfer students from other institutions need a 2.25 transfer GPA, and students transferring from other USU majors need a 2.25 cumulative GPA for admission to the Biology and Public Health majors in good standing. Admission requirements differ for the Composite Teaching—Biological Science Major, as explained below.

Admission Requirements for the Composite Teaching—Biological Science Major

New freshmen admitted to USU in good standing qualify for admission to this major. To qualify for admission to the Secondary Teacher Education Program (STEP), new freshmen must acquire a cumulative 2.75 GPA and 60 credits of coursework. Transfer students from other institutions or other USU majors need a cumulative 2.75 GPA and 60 credits of coursework to be admitted to the major and the STEP. For information on additional admission criteria, students should contact the Department of Secondary Education.

GPA Requirement

To graduate, a candidate for any bachelor's degree offered by the Department of Biology must maintain a grade point average of 2.25 in all Department of Biology (BIOL or PUBH prefix) courses required for the major (Composite Teaching also requires a 2.75 cumulative GPA) and a grade of C- or better in BIOL 1210 and 1220. The *Pass-Fail* option is not acceptable for any course required for the degree, but *D* grades are permitted within the restrictions of the 2.25 GPA. The Composite Teaching—Biological Science Major requires a cumulative overall GPA of 2.75 for admission and graduation. The 2.25 GPA requirement applies to the Biology, Public Health, and BioMath minors.

BS Degree in Biology

Four different emphases are available within the Biology degree. The **Biology Emphasis** is the most flexible option. Electives may be selected in any subdiscipline the student wishes to emphasize (e.g., botany, ecology, zoology, entomology, microbiology, etc.). The **Cellular/Molecular** and **Ecology/Biodiversity** emphases provide more directed training that is appropriate for research or other

technical employment in academic institutions, government agencies, and the private sector. They also provide excellent preparation for graduate work. The **Environmental Emphasis** prepares students in the biological and physical sciences as they relate to environmental problems and concerns. This degree serves as a foundation for graduate work and provides practical training for employment at the bachelor's degree level. Emphases will be listed on transcripts to indicate the student's specialization. The course requirements are as follows:

Required Biology Courses (21-22 credits)

BIOL 1210 Biology I (F).....	4
BIOL 1220 (BLS) Biology II (Sp).....	4
BIOL 2220 General Ecology (F, Sp).....	3
BIOL 3200 (QI) Principles of Genetics (F, Sp, Su).....	4
BIOL 3300 General Microbiology (F, Sp) (4 cr) or	
BIOL 5210 Cell Biology (F) (3 cr).....	3 or 4
BIOL 5250 (CI) Evolutionary Biology (F,Sp).....	3

Field Course Requirement (2-3 credits)

Students must take one course from the following list:

BIOL 2410 Plants and Fungi in the Field (Su).....	2
BIOL 3220 (QI) Field Ecology (F).....	2
BIOL 4500 Applied Entomology (Sp).....	3
BIOL 5530 Insect Systematics and Evolution (F).....	3
BIOL 5550 Freshwater Invertebrates (Sp).....	3
BIOL 5560 Ornithology (Sp).....	3
BIOL 5570 Herpetology (Sp).....	3

Physiology Course with Lab Requirement (4-5 credits)

Students must take one upper-division physiology course with an integrated or separate laboratory from the following list:

Courses with integrated laboratories:

BIOL 4400 (QI) Plant Physiology (F).....	4
BIOL 5300 (QI) Microbial Physiology (Sp).....	4

Courses with separate lecture and lab; both must be taken to meet the requirement:

BIOL 5600 Comparative Animal Physiology (F).....	3
BIOL 5610 (QI) Animal Physiology Laboratory (F, Sp).....	2
Or	
BIOL 5620 Medical Physiology (Sp) (Alt. Years).....	3
BIOL 5610 (QI) Animal Physiology Laboratory (F, Sp).....	2

Biology Electives (10 credits)

Students must select an additional 10 credits of 4000-level and above BIOL or PUBH prefix courses as electives. A maximum of 4 credits from the following courses may be included among the 10 elective credits.

BIOL 4250 Internship/Co-op.....	1-2
BIOL 4710 Teaching Internship.....	1
BIOL 5800 Undergraduate Research.....	1-3
Seminar courses.....	1-2

Required Physical Science Courses (26 credits)

CHEM 1210 Principles of Chemistry I (F, Sp).....	4
CHEM 1230 Chemical Principles Laboratory I (F, Sp).....	1
CHEM 1220 (BPS) Principles of Chemistry II (F, Sp, Su).....	4
CHEM 1240 Chemical Principles Laboratory II (F, Sp).....	1
CHEM 2300 Principles of Organic Chemistry (F).....	3
CHEM 2330 Organic Chemistry Laboratory I (F, Sp).....	1
CHEM 3700 Introductory Biochemistry (Sp).....	3
CHEM 3710 Introductory Biochemistry Laboratory (Sp).....	1

Department of Biology

PHYX 2110 The Physics of Living Systems I (F) (4 cr) and	
PHYX 2120 (BPS) The Physics of Living Systems II (Sp) (4 cr)	8
Or	
PHYX 2210 (QI) General Physics—Science and Engineering I (F, Sp, Su) (4 cr) and	
PHYX 2220 (BPS/QI) General Physics—Science and Engineering II (F, Sp, Su) (4 cr)	8

Mathematics and Statistics Requirement (7 credits)

MATH 1210 (QL) Calculus I (F, Sp, Su)	4
STAT 3000 (QI) Statistics for Scientists (F, Sp, Su)	3

Cellular/Molecular Emphasis

Required Biology Courses (30 credits)

BIOL 1210 Biology I (F)	4
BIOL 1220 (BLS) Biology II (Sp)	4
BIOL 2220 General Ecology (F, Sp)	3
BIOL 3200 (QI) Principles of Genetics (F, Sp, Su)	4
BIOL 5190 Molecular Genetics (Sp)	3
BIOL 5210 Cell Biology (F)	3
BIOL 5230 Developmental Biology (Sp)	3
BIOL 5250 (CI) Evolutionary Biology (F, Sp)	3

Choose one of the following Biotechnology courses:

BIOL 5160 Methods in Biotechnology: Cell Culture (Sp)	3
BIOL 5240 Methods in Biotechnology: Protein Purification Techniques (Sp)	3
BIOL 5260 Methods in Biotechnology: Molecular Cloning (F)	3

Physiology Course with Lab Requirement (4-5 credits)

Students must take one upper-division physiology course with an integrated or separate laboratory from the following list:

Courses with integrated laboratories:

BIOL 4400 (QI) Plant Physiology (F)	4
BIOL 5300 (QI) Microbial Physiology (Sp)	4

Courses with separate lecture and lab; both must be taken to meet the requirement:

BIOL 5600 Comparative Animal Physiology (F)	3
BIOL 5610 (QI) Animal Physiology Laboratory (F, Sp)	2
Or	
BIOL 5620 Medical Physiology (Sp) (Alt. Years)	3
BIOL 5610 (QI) Animal Physiology Laboratory (F,Sp)	2

Biology Electives (9 credits)

Students must select an additional 9 credits of 4000-level and above BIOL prefix courses as electives. BIOL 3300 (General Microbiology) may also be included toward these elective credits (even though it is a 3000-level course.) A maximum of 4 credits from the following courses may be included among the 9 elective credits:

BIOL 4250 Internship/Co-op	1-2
BIOL 4710 Teaching Internship	1
BIOL 5800 Undergraduate Research	1-3
Seminar courses	1-2

Required Physical Science Courses (36 credits)

CHEM 1210 Principles of Chemistry I (F, Sp)	4
CHEM 1230 Chemical Principles Laboratory I (F, Sp)	1
CHEM 1220 (BPS) Principles of Chemistry II (F, Sp, Su)	4
CHEM 1240 Chemical Principles Laboratory II (F, Sp)	1
CHEM 2310 Organic Chemistry I (F)	4
CHEM 2330 Organic Chemistry Laboratory I (F, Sp)	1
CHEM 2320 Organic Chemistry II (Sp)	4
CHEM 2340 Organic Chemistry Laboratory II (F, Sp)	1

CHEM 5700 General Biochemistry I (F)	3
CHEM 5710 General Biochemistry II (Sp)	3
CHEM 5720 General Biochemistry Laboratory (Sp)	2

PHYX 2110 The Physics of Living Systems I (F) (4 cr) and	
PHYX 2120 (BPS) The Physics of Living Systems II (Sp) (4 cr)	8
Or	
PHYX 2210 (QI) General Physics—Science and Engineering I (F, Sp, Su) (4 cr) and	
PHYX 2220 (BPS/QI) General Physics—Science and Engineering II (F, Sp, Su) (4 cr)	8

Mathematics and Statistics Requirement (7 credits)

MATH 1210 (QL) Calculus I (F, Sp, Su)	4
STAT 3000 (QI) Statistics for Scientists (F, Sp, Su)	3

Ecology/Biodiversity Emphasis

Required Biology Courses (24 credits)

BIOL 1210 Biology I (F)	4
BIOL 1220 (BLS) Biology II (Sp)	4
BIOL 2220 General Ecology (F, Sp)	3
BIOL 3200 (QI) Principles of Genetics (F, Sp, Su)	4
BIOL 3220 (QI) Field Ecology (F)	2
BIOL 3300 General Microbiology (F, Sp)	4
BIOL 5250 (CI) Evolutionary Biology (F, Sp)	3

Physiology Course with Lab Requirement (4-5 credits)

Students must take one upper-division physiology course with an integrated or separate laboratory from the following list:

Courses with integrated laboratories:

BIOL 4400 (QI) Plant Physiology (F)	4
BIOL 5300 (QI) Microbial Physiology (Sp)	4

Courses with separate lecture and lab; both must be taken to meet the requirement:

BIOL 5600 Comparative Animal Physiology (F)	3
BIOL 5610 (QI) Animal Physiology Laboratory (F, Sp)	2
Or	
BIOL 5620 Medical Physiology (Sp) (Alt. Years)	3
BIOL 5610 (QI) Animal Physiology Laboratory (F, Sp)	2

Clusters (8-10 credits)

Students must take one course from each of the following three clusters.

Plant Biology:

BIOL 2410 Plants and Fungi in the Field (Su)	2
BIOL 4420 Plant Taxonomy (Sp)	3

Animal Biology:

BIOL 4500 Applied Entomology (Sp)	3
BIOL 5530 Insect Systematics and Evolution (F)	3
BIOL 5550 Freshwater Invertebrates (Sp)	3
BIOL 5560 Ornithology (Sp)	3
BIOL 5570 Herpetology (Sp)	3
BIOL 5580 Mammalogy (F)	3

Ecology/Evolution:

BIOL 4060 (CI) Exploring Animal Behavior (Sp)	3
BIOL 5010 Biogeography (Sp)	3
BIOL 5020 (QI) Modeling Biological Systems (F)	3
BIOL 5380 Evolutionary Genetics (F)	4
BIOL 5590 Animal Community Ecology (Sp) (Alt. Years)	4
FRWS 4600 Conservation Biology (F)	3

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Electives (2-3 credits)

Students must take one additional course from this list or the clusters above or other upper-division courses approved by advisor.

BIOL 4100 Genetics Laboratory (F)	2
BIOL 4410 Plant Structure (Sp)	3
BIOL 5310 Soil Microbiology (F) (Alt. Years)	3
BIOL 5800 Undergraduate Research (F, Sp, Su)	2-3

Required Physical Science Courses (34 credits)

CHEM 1210 Principles of Chemistry I (F, Sp)	4
CHEM 1230 Chemical Principles Laboratory I (F, Sp)	1
CHEM 1220 (BPS) Principles of Chemistry II (F, Sp, Su)	4
CHEM 1240 Chemical Principles Laboratory II (F, Sp)	1
CHEM 2300 Principles of Organic Chemistry (F)	3
CHEM 2330 Organic Chemistry Laboratory I (F, Sp)	1
CHEM 3700 Introductory Biochemistry (Sp)	3
CHEM 3710 Introductory Biochemistry Laboratory (Sp)	1
GEOL 1150 (BPS) The Dynamic Earth: Physical Geology (F, Sp)	4
SOIL 3000 Fundamentals of Soil Science (F, Sp)	4

PHYX 2110 The Physics of Living Systems I (F) (4 cr) and	
PHYX 2120 (BPS) The Physics of Living Systems II (Sp) (4 cr)	8
Or	
PHYX 2210 (QI) General Physics—Science and Engineering I (F, Sp, Su) (4 cr) and	
PHYX 2220 (BPS/QI) General Physics—Science and Engineering II (F, Sp, Su) (4 cr)	8

Mathematics and Statistics Requirement (7 credits)

MATH 1210 (QL) Calculus I (F, Sp, Su)	4
STAT 3000 (QI) Statistics for Scientists (F, Sp, Su)	3

Environmental Emphasis

Required Biology Courses (24 credits)

BIOL 1210 Biology I (F)	4
BIOL 1220 (BLS) Biology II (Sp)	4
BIOL 2220 General Ecology (F, Sp)	3
BIOL 3200 (QI) Principles of Genetics (F, Sp, Su)	4
BIOL 3220 (QI) Field Ecology (F)	2
BIOL 3300 General Microbiology (F, Sp)	4
BIOL 5250 (CI) Evolutionary Biology (F, Sp)	3

Plant Identification (2-3 credits)

Choose one of the following courses:

BIOL 2410 Plants and Fungi in the Field (Su)	2
BIOL 4420 Plant Taxonomy (Sp)	3

Physiology Course with Lab Requirement (4-5 credits)

Students must take one upper-division physiology course with an integrated or separate laboratory from the following list:

Courses with integrated laboratories:

BIOL 4400 (QI) Plant Physiology (F)	4
BIOL 5300 (QI) Microbial Physiology (Sp)	4

Courses with separate lecture and lab; both must be taken to meet the requirement:

BIOL 5600 Comparative Animal Physiology (F)	3
BIOL 5610 (QI) Animal Physiology Laboratory (F, Sp)	2
Or	
BIOL 5620 Medical Physiology (Sp) (Alt. Years)	3
BIOL 5610 (QI) Animal Physiology Laboratory (F, Sp)	2

Biology Elective Courses (12 credits)

Students must take 12 credits from the following list or others approved by advisor. Up to 3 credits of BIOL 5800 may be included.

ADVS 5400 Environmental Toxicology (Sp)	3
BIOL 4500 Applied Entomology (Sp)	3
BIOL 5020 (QI) Modeling Biological Systems (F)	3
BIOL 5310 Soil Microbiology (F) (Alt. Years)	3
BIOL 5320 Soil Microbiology Laboratory (F) (Alt. Years)	2
BIOL 5410 Introduction to Plant Pathology (F)	4
BIOL 5800 Undergraduate Research (F, Sp, Su)	1-3
CEE/SOIL 5620 Aquatic Chemistry (F)	3
GEOL 1150 (BPS) The Dynamic Earth: Physical Geology (F, Sp)	4
PUBH 3610 Environmental Management (F)	3
SOIL 3000 Fundamentals of Soil Science (F, Sp)	4

Required Physical Science Courses (36 credits)

CHEM 1210 Principles of Chemistry I (F, Sp)	4
CHEM 1230 Chemical Principles Laboratory I (F, Sp)	1
CHEM 1220 (BPS) Principles of Chemistry II (F, Sp, Su)	4
CHEM 1240 Chemical Principles Laboratory II (F, Sp)	1
CHEM 2310 Organic Chemistry I (F)	4
CHEM 2330 Organic Chemistry Laboratory I (F, Sp)	1
CHEM 2320 Organic Chemistry II (Sp)	4
CHEM 2340 Organic Chemistry Laboratory II (F, Sp)	1
CHEM 3600 (QI) Quantitative Analysis (F)	3
CHEM 3610 Quantitative Analysis Laboratory (F)	1
CHEM 3700 Introductory Biochemistry (Sp)	3
CHEM 3710 Introductory Biochemistry Laboratory (Sp)	1

PHYX 2110 The Physics of Living Systems I (F) (4 cr) and	
PHYX 2120 (BPS) The Physics of Living Systems II (Sp) (4 cr)	8
Or	
PHYX 2210 (QI) General Physics—Science and Engineering I (F, Sp, Su) (4 cr) and	
PHYX 2220 (BPS/QI) General Physics—Science and Engineering II (F, Sp, Su) (4 cr)	8

Mathematics and Statistics Requirement (7 credits)

MATH 1210 (QL) Calculus I (F, Sp, Su)	4
STAT 3000 (QI) Statistics for Scientists (F, Sp, Su)	3

BS Degree in Composite Teaching—Biological Science

The Composite Teaching—Biological Science Major leads to licensure to teach in secondary schools. Students who may wish to teach Integrated Science at the middle or junior high school level should talk to their advisor about completing the courses necessary for an Integrated Science endorsement. **Note:** Beginning in 2006, all USU teacher education candidates will be required to take and pass the content exam approved by the Utah State Office of Education in their major content area prior to student teaching. The course requirements are as follows:

Required Courses (32 credits)

BIOL 1210 Biology I (F)	4
BIOL 1220 (BLS) Biology II (Sp)	4
BIOL 2000 Human Physiology (F, Sp, Su)	4
BIOL 2220 General Ecology (F, Sp)	3
BIOL 3220 (QI) Field Ecology (F)	2
BIOL 3200 (QI) Principles of Genetics (F, Sp, Su)	4
BIOL 3300 General Microbiology (F, Sp)	4
BIOL 4100 Genetics Laboratory (F) (Alt. Years)	2
BIOL 5250 (CI) Evolutionary Biology (F, Sp)	3
SCI 4300 Science in Society (F, Sp)	2

Physiology Course with Lab Requirement (4-5 credits)

Students must take one upper-division physiology course with an integrated or separate laboratory from the following list:

Courses with integrated laboratories:

BIOL 4400 (QI) Plant Physiology (F).....	4
BIOL 5300 (QI) Microbial Physiology (Sp)	4

Courses with separate lecture and lab; both must be taken to meet the requirement:

BIOL 5600 Comparative Animal Physiology (F).....	3
BIOL 5610 (QI) Animal Physiology Laboratory (F, Sp).....	2
Or	
BIOL 5620 Medical Physiology (Sp) (Alt. Years).....	3
BIOL 5610 (QI) Animal Physiology Laboratory (F, Sp).....	2

Required Physical Science Courses (21 credits)

GEOL 1150 (BPS) The Dynamic Earth: Physical Geology (F, Sp).....	4
CHEM 1110 (BPS) General Chemistry I (F, Sp).....	4
CHEM 1120 (BPS) General Chemistry II (Sp)	4
CHEM 1130 General Chemistry Laboratory (Sp).....	1

PHYX 2110 The Physics of Living Systems I (F) (4 cr) and
PHYX 2120 (BPS) The Physics of Living Systems II (Sp) (4 cr)..... 8

Or
PHYX 2210 (QI) General Physics—Science and Engineering I
 (F, Sp, Su) (4 cr) and
PHYX 2220 (BPS/QI) General Physics—Science and Engineering II
 (F, Sp, Su) (4 cr)..... 8

Mathematics and Statistics Requirement (7 credits)

MATH 1210 (QL) Calculus I (F, Sp, Su).....	4
STAT 3000 (QI) Statistics for Scientists (F, Sp, Su)	3

Required Courses for the Secondary Teacher Education Program (STEP) (35 credits)

Level 1:

INST 3500 Technology Tools for Secondary Teachers (F, Sp, Su).....	1
SCED 3100 Motivation and Classroom Management (F, Sp)	3
SCED 3210 (CI/DSS) Educational and Multicultural Foundations (F, Sp).....	3
SCED 3300 Clinical Experience I (F, Sp)	1
SCED 3400 Teaching Science I (F).....	3

Level 2:

SPED 4000 Education of Exceptional Individuals (may be taken anytime) (F, Sp, Su).....	2
SCED 4200 (CI) Reading, Writing, and Technology (F, Sp)	3
SCED 4210 Cognition and Evaluation of Student Learning (F, Sp)	3
SCED 4300 Clinical Experience II (F, Sp)	1
SCED 4400 Teaching Science II (Sp).....	3

Level 3:

SCED 5500 Student Teaching Seminar (F, Sp).....	2
SCED 5630 Student Teaching in Secondary Schools (F, Sp)	10

BA Degrees in Biology and Composite Teaching—Biological Science

The student must complete the requirements for the BS (above) plus two years of a foreign language. (See page 55 of this catalog.)

BS Degree in Public Health

A four-year program leading to the Bachelor of Science in Public Health is offered by the Department of Biology with options in either

environmental health, industrial hygiene, or public health education. Individuals completing the environmental health option are qualified to take the Registered Environmental Health Specialist/Sanitarian Examination. Those completing the industrial hygiene option are granted benefits toward both the Certified Industrial Hygienist and the Certified Safety Professional examinations. The Public Health degree requires a core of biology courses similar to that required for the biology degrees; additional biology and public health courses; and chemistry, physics, mathematics, statistics, and allied science and engineering courses appropriate to each emphasis. The course requirements are as follows:

Industrial Hygiene Emphasis

Required Biology Courses (16 credits)

BIOL 1210 Biology I (F).....	4
BIOL 1220 (BLS) Biology II (Sp).....	4
BIOL 2000 Human Physiology (F, Sp, Su).....	4
BIOL 3300 General Microbiology (F, Sp)	4

Required Physical Science Courses (30 credits)

CHEM 1210 Principles of Chemistry I (F, Sp)	4
CHEM 1230 Chemical Principles Laboratory I (F, Sp)	1
CHEM 1220 (BPS) Principles of Chemistry II (F, Sp, Su)	4
CHEM 1240 Chemical Principles Laboratory II (F, Sp)	1
CHEM 2300 Principles of Organic Chemistry (F).....	3
CHEM 2330 Organic Chemistry Laboratory I (F, Sp)	1
CHEM 3600 (QI) Quantitative Analysis (F).....	3
CHEM 3610 Quantitative Analysis Laboratory (F).....	1
CHEM 3700 Introductory Biochemistry (Sp)	3
CHEM 3710 Introductory Biochemistry Laboratory (Sp)	1

PHYX 2110 The Physics of Living Systems I (F) (4 cr) and
PHYX 2120 (BPS) The Physics of Living Systems II (Sp) (4 cr)..... 8

Or
PHYX 2210 (QI) General Physics—Science and Engineering I
 (F, Sp, Su) (4 cr) and
PHYX 2220 (BPS/QI) General Physics—Science and Engineering II
 (F, Sp, Su) (4 cr)..... 8

Mathematics and Statistics Requirement (7 credits)

MATH 1210 (QL) Calculus I (F, Sp, Su).....	4
STAT 3000 (QI) Statistics for Scientists (F, Sp, Su)	3

Required Program Courses (30 credits)

PUBH 3310 Occupational Health and Safety (F)	3
PUBH 3610 Environmental Management (F).....	3
PUBH 4040 Fundamentals of Epidemiology (Sp).....	3
PUBH 4310 Industrial Hygiene Recognition of Hazards (F)	4
PUBH 4320 Industrial Hygiene Chemical Hazard Evaluation (Sp)	3
PUBH 4330 Industrial Hygiene Physical Hazards (Sp).....	3
PUBH 4380 Industrial Hygiene Internship (F, Sp, Su).....	3
PUBH 5330 (QI) Industrial Hygiene Chemical Hazard Control (F)	3
PUBH 5500 (CI) Public Health Management (F, Sp)	2
ADVS 5400 Environmental Toxicology (Sp).....	3

Elective Options (select 5 credits)

BIOL 3200 (QI) Principles of Genetics (F, Sp, Su).....	4
CEE 5610 Environmental Quality Analysis (F)	3
PUBH 4300 Industrial Hygiene Seminar (F)	1
PUBH 4410 Industrial Safety (Sp).....	3
PUBH 5340 Industrial Hygiene and Safety Programs (Sp).....	2
PUBH 5670 Hazardous Chemicals Handling and Safety (Sp).....	2
PUBH 5730 Analysis and Fate of Environmental Contaminants (Sp).....	3
PUBH 5790 Accident and Emergency Management (Sp).....	3

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Environmental Health Emphasis

Required Biology Courses (19 credits)

BIOL 1210 Biology I (F)	4
BIOL 1220 (BLS) Biology II (Sp)	4
BIOL 2000 Human Physiology (F, Sp, Su)	4
BIOL 2220 General Ecology (F, Sp)	3
BIOL 3300 General Microbiology (F, Sp)	4

Required Physical Science Courses (22 credits)

CHEM 1210 Principles of Chemistry I (F, Sp)	4
CHEM 1230 Chemical Principles Laboratory I (F, Sp)	1
CHEM 1220 (BPS) Principles of Chemistry II (F, Sp, Su)	4
CHEM 1240 Chemical Principles Laboratory II (F, Sp)	1
CHEM 2300 Principles of Organic Chemistry (F)	3
CHEM 2330 Organic Chemistry Laboratory I (F, Sp)	1

PHYX 2110 The Physics of Living Systems I (F) (4 cr) and PHYX 2120 (BPS) The Physics of Living Systems II (Sp) (4 cr)	8
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Or

PHYX 2210 (QI) General Physics—Science and Engineering I (F, Sp, Su) (4 cr) and PHYX 2220 (BPS/QI) General Physics—Science and Engineering II (F, Sp, Su) (4 cr)	8
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Mathematics and Statistics Requirement (7 credits)

MATH 1210 (QL) Calculus I (F, Sp, Su)	4
STAT 3000 (QI) Statistics for Scientists (F, Sp, Su)	3

Required Program Courses (29 credits)

PUBH 3310 Occupational Health and Safety (F)	3
PUBH 3610 Environmental Management (F)	3
PUBH 4000 Public Health Field Experience (F, Sp, Su)	3
PUBH 4030 Communicable Disease Control (F)	3
PUBH 4040 Fundamentals of Epidemiology (Sp)	3
PUBH 4310 Industrial Hygiene Recognition of Hazards (F)	4
PUBH 5000 Public Health Seminar (Sp)	1
PUBH 5500 (CI) Public Health Management (F, Sp)	2
PUBH 5730 Analysis and Fate of Environmental Contaminants (Sp)	3
NFS 5110 (CI) Food Microbiology (Sp)	4

Required Electives (select 10 credits)

ADVS 5400 Environmental Toxicology (Sp)	3
BIOL 3220 (QI) Field Ecology (F)	2
BIOL 4420 Plant Taxonomy (Sp)	3
BIOL 5550 Freshwater Invertebrates (Sp)	3
CHEM 3700 Introductory Biochemistry (Sp)	3
CHEM 3710 Introductory Biochemistry Laboratory (Sp)	1
SOIL 3000 Fundamentals of Soil Science (F, Sp)	4
SPCH 1050 (CI) Public Speaking (F, Sp)	3

Public Health Education Emphasis

Required Biology Courses (16 credits)

BIOL 1210 Biology I (F)	4
BIOL 1220 (BLS) Biology II (Sp)	4
BIOL 2000 Human Physiology (F, Sp, Su)	4
BIOL 3300 General Microbiology (F, Sp)	4

Required Physical Science Courses (18 credits)

CHEM 1210 Principles of Chemistry I (F, Sp)	4
CHEM 1230 Chemical Principles Laboratory I (F, Sp)	1
CHEM 1220 (BPS) Principles of Chemistry II (F, Sp, Su)	4
CHEM 1240 Chemical Principles Laboratory II (F, Sp)	1
CHEM 1120 (BPS) General Chemistry II (Sp)	4
PHYX 1200 (BPS) Introduction to Physics by Hands-on Exploration (Sp)	4

Mathematics and Statistics Requirement (7 credits)

MATH 1210 (QL) Calculus I (F, Sp, Su)	4
STAT 3000 (QI) Statistics for Scientists (F, Sp, Su)	3

Required Program Courses (15 credits)

PUBH 3120 Family and Community Health (Sp)	3
PUBH 4000 Public Health Field Experience (F, Sp, Su)	3
PUBH 4030 Communicable Disease Control (F)	3
PUBH 4040 Fundamentals of Epidemiology (Sp)	3
PUBH 5000 Public Health Seminar (Sp)	1
PUBH 5500 (CI) Public Health Management (F, Sp)	2

Required Supporting Courses (33 credits)

HEP 2000 First Aid and Emergency Care (F, Sp, Su)	2
HEP 2500 Health and Wellness (F, Sp, Su)	2
HEP 3000 Drugs and Human Behavior (F, Su)	3
HEP 3600 (CI) Introduction to Community Health (F)	3
HEP 3800 Grant Proposal Writing (Sp)	3
HEP 3900 Social Marketing in Health Education (Sp)	3
HEP 4200 (QI) Planning and Evaluation for Health Education (F)	3
NFS 1020 (BLS) Science and Application of Human Nutrition (F, Sp, Su)	3
NFS 5210 Advanced Public Health Nutrition (Sp)	2
SOC 3330 Medical Sociology (F)	3
SOC 3500 Social Psychology (F, Sp)	3
SPCH 1050 (CI) Public Speaking (F, Sp)	3

Biology Minor

The Biology minor requires completion of the following courses. A minimum cumulative GPA of 2.25 is required for these courses.

BIOL 1210 Biology I (F)	4
BIOL 1220 (BLS) Biology II (Sp)	4
Upper-division (3000-level and above) BIOL prefix courses	12

Note: Although BIOL/NR 2220 is a lower-division course, it may be counted toward the 12 elective credits.

BioMath Minor

This minor requires mathematics and quantitative biology courses beyond those required for the basic biology degrees. It is an excellent option for students considering graduate work. Biology majors may take this minor through the Mathematics and Statistics Department. Requirements for the BioMath minor include:

BIOL 1210 Biology I (F)	4
BIOL 1220 (BLS) Biology II (Sp)	4
MATH 1210 (QL) Calculus I (F, Sp, Su)	4
MATH 1220 (QL) Calculus II (F, Sp, Su)	4
MATH 2270 (QI) Linear Algebra (F)	3
MATH 2280 (QI) Ordinary Differential Equations (Sp)	3
STAT 3000 (QI) Statistics for Scientists (F, Sp)	3
MATH/BIOL 4230 (QI) Applied Mathematics in Biology (Sp)	3

(Note: MATH 2250 may substitute for MATH 2270 and 2280.)

Biology majors must take one course from the biology electives (listed below), and two courses from the mathematics and statistics electives (listed below). Mathematics and Statistics majors must take two courses from the biology electives, and one course from the mathematics and statistics electives. All other majors must take two courses from each set of electives.

Biology Electives:

BIOL 3200 (QI) Principles of Genetics (F, Sp, Su)	4
BIOL 3220 (QI) Field Ecology (F)	2
BIOL 4400 (QI) Plant Physiology (F)	4
BIOL 5020 (QI) Modeling Biological Systems (F)	3
BIOL 5300 (QI) Microbial Physiology (Sp)	4

BIOL 5380 Evolutionary Genetics (F)	4
BIOL 5610 (QI) Animal Physiology Laboratory (F, Sp).....	2
BIOL 5800 Undergraduate Research (F, Sp, Su) (3 credits min.).....	3
BMET 5500 Land-Atmosphere Interactions (Sp)	3
PUBH 5330 (QI) Industrial Hygiene Chemical Hazard Control (F)	3

Mathematics and Statistics Electives

MATH 4630 Computer Aided Math for Scientists and Engineers (Sp) ..	3
MATH 5410 Methods of Applied Mathematics (F).....	3
MATH 5420 Partial Differential Equations (Sp)	3
MATH 5460 Introduction to the Theory and Application of Nonlinear Dynamical Systems (Sp)	3
MATH 5610 Computational Linear Algebra and Solution of Systems of Equations (F).....	3
MATH 5620 Numerical Solution of Differential Equations (Sp)	3
MATH 5710 Introduction to Probability (F, Sp)	3
MATH 5910 Directed Reading and Conference (F, Sp, Su) (3 credits min.).....	3
STAT 5100 (CI/QI) Linear Regression and Time Series (F)	3
STAT 5110 Theory of Linear Models (F)	3
STAT 5120 Categorical Data Analysis (F)	3
STAT 5200 Design of Experiments (Sp).....	3
STAT 5300 (QI) Statistical Process Control (Sp).....	3
STAT 5600 (CI) Applied Multivariate Statistics (Sp)	3
STAT 5940 Directed Reading and Conference (F, Sp, Su) (3 credits min.).....	3

BIOL 5800, MATH 5910, and STAT 5940 must involve mathematical or statistical analysis of a biological problem.

Public Health Minor

The Public Health minor requires completion of the following:

BIOL 1210 Biology I (F).....	4
BIOL 1220 (BLS) Biology II (Sp).....	4
Upper-division (3000-level and above) Public Health elective courses	12

Field Trips and Laboratory Fees

Many biology courses require field trips. Those enrolled are expected to dress appropriately for the conditions and observe any safety precautions issued by instructors. Many courses require modest laboratory fees.

Financial Support

Scholarships, assistantships, grants-in-aid, and work-study programs are available from the University. Both the College of Science and the Department of Biology offer scholarships. Applications for departmental and college scholarships should be submitted during early spring semester. Contact the College of Science Office (ESLC 245) and the Biology Advising Center (BNR 101) for details.

Departmental Honors

Students who would like to experience greater academic depth within their major are encouraged to enroll in departmental honors. Through original, independent work, Honors students enjoy the benefits of close supervision and mentoring, as they work one-on-one with faculty in select upper-division departmental courses. Honors students also complete a senior project, which provides another opportunity to collaborate with faculty on a problem that is significant, both personally and in the student's discipline. Participating in departmental honors enhances students' chances for obtaining fellowships and admission to graduate school.

An Honors Plan is available for students desiring a BS or BA degree "with Honors" in Biology. Departmental Honors requires the completion of 9 credits of Honors coursework in upper-division BIOL courses, BIOL 5800H, and a research-based Bachelor's Thesis. For details, students should contact: Kimberly A. Sullivan, (435) 797-3713, yejunco@biology.usu.edu.

Additional Information

For more information about requirements for the majors and minors within the Biology Department, see major requirement sheets, available from the Biology Department, or online at: <http://www.usu.edu/ats/majorsheets/>

Graduate Programs

Admission Requirements

See general admission requirements on pages 93-94. To be recommended for matriculated status, an applicant must have earned a bachelor's degree (or equivalent) from an accredited institution, and a Biology faculty member must agree to serve as major professor for that applicant. The Department of Biology also considers these guidelines for admission: (1) the transcript should show a minimum GPA of 3.0 (B); and (2) the scores on the verbal and quantitative GRE should be above the 50th percentile and the analytical writing score should be 3.5 or above. Advanced GREs (especially biology) are also recommended. Applicants for whom English is not the primary language must have scored at least 575 on the TOEFL. The applicant's undergraduate program should be similar to that offered by the Department of Biology at Utah State University, which includes the following and their prerequisites: general biology, microbiology, genetics, ecology, physiology, cell biology, developmental biology, and evolution; general and organic chemistry; calculus; statistics; and physics. Other preparatory courses may be specified by the student's supervisory committee.

Degree Programs

For those who have demonstrated strong academic capability as well as research interest, the Department of Biology offers the **Master of Science Degree** and the **Doctor of Philosophy Degree** in either Biology or Ecology. Graduate degrees in **Toxicology** are available through the Interdepartmental Program in Toxicology.

Undergraduate majors in Biology at USU with especially strong backgrounds and interest in research may apply for study of the Master of Science degree as **transitional students**. Acceptance as a transitional student allows undergraduates with advanced standing to integrate up to 9 credits of graduate work into the final semesters of their Bachelor of Science study. Acceptance into this program, as into all graduate programs in Biology, is closely regulated. Formal application through the School of Graduate Studies is required.

Course Requirements

Biology MS and PhD Degrees

Course requirements are determined by the student's supervisory committee. They will vary depending on the research emphasis selected and the background of the student.

Department of Biology

Ecology MS and PhD Degrees

For specific requirements, see the description of the Ecology Interdepartmental Program (pages 215-216).

Research

The Department of Biology provides a dynamic and broad base for research and graduate study through a balanced program of basic and applied studies at ecosystem, population, organismal, cellular, and molecular levels. An outstanding variety of field sites; animal, plant, and microbe growth facilities; and modern well-equipped laboratories are available. Also, the Intermountain Herbarium, an excellent insect collection, the USDA/ARS U.S. National Pollinating Insects Collection, the Stable Isotope Laboratory, and the Center for Integrated BioSystems exist as research and support facilities.

Faculty members participate in and are supported by several interdepartmental programs, including the Ecology Center and the Center for Environmental Toxicology. In addition, many less formal contacts and interactions exist with colleagues in the colleges of Agriculture, Natural Resources, and Science.

Students are encouraged to carefully consider how their career goals match the faculty's research interests. Prospective students are strongly encouraged to contact faculty members with whom they are interested in working. Because of the combination of a diverse interdisciplinary base and excellent focused research programs, students have an opportunity to learn the philosophies and methods of many branches of biology.

Financial Assistance

Research assistantships are available from the grants of major professors and from Utah Agricultural Experiment Station funds. Teaching assistantships are awarded annually. All awards are made on a competitive basis and specific teaching needs are considered in awarding teaching assistantships. Given satisfactory performance, MS students are supported for at least two years and PhD candidates for at least four years on teaching assistantships. The department may also recommend particularly qualified students for College of Science or University fellowships. Admission to the graduate program of the Department of Biology does not guarantee financial support; however, applicants will not normally be admitted without financial support.

Career Opportunities

Completion of graduate degrees in Biology prepares students for careers in teaching and research in universities and colleges. Many graduates also find employment with private industry and state and national governmental agencies. Specific employment possibilities will depend on the nature of the graduate program pursued. The extensive background provided by a graduate degree also prepares students for eventual administrative responsibilities.

Research Emphases

Research areas of departmental faculty are diverse. Areas of research currently include: **Cellular and Molecular Biology:** plant-microbial interactions; molecular neurobiology and biophysics; gene regulation and signal transduction; membrane transport; molecular virology; **Ecology and Behavior:** community and ecosystem ecology; insect ecology and behavior; pollination biology; plant-insect interactions; vertebrate behavioral ecology; mathematical and computer modeling;

soil microbiology; fungal ecology; biological control; integrated pest management (IPM); **Physiology and Comparative Biology:** toxicology and industrial hygiene; insect pathology; plant physiology and pathology; and **Systematics and Evolution:** systematics and evolution of plants, fungi, insects, reptiles, and amphibians; evolutionary quantitative genetics; biogeography; evolution of chemical defenses and resistance in microorganisms, insects, reptiles, and amphibians.

Research and Teaching Facilities

Herbarium

Graduate study in plant taxonomy offered in the Department of Biology utilizes the extensive facilities of the Intermountain Herbarium. The collection includes over 220,000 research specimens. About 50 percent are from the Intermountain Region, while most of the remainder are from other regions of North America.

Insect Collection

Comprising over a million specimens, the insect collection is available to scientists and graduate students involved in taxonomic research and to those requiring identification of insects in various research projects. The collection primarily covers the Intermountain Region, but it also contains species from nearly all areas of the world. The BNR Building also houses the USDA/ARS U.S. National Pollinating Insect Collection.

Laser Scanning Confocal Microscope

The Department of Biology has a BioRad 1024 Laser Scanning Confocal Microscope. This state-of-the-art technology utilizes highly tuned lasers to give detailed sectional views of the interior of intact structures such as cells and tissues, and greatly extends the advantages of fluorescence microscopy. This microscope is utilized by researchers campuswide, and is an indispensable tool for molecular and cellular studies.

Center for Integrated BioSystems (CIB)

The CIB operates three service laboratories and a variety of research projects. The service laboratories provide essential biological resources for biotechnology research and development including: DNA sequencing, peptide synthesis, protein sequencing, antibodies, and fermentation.

Biology Faculty

Professors

Anne J. Anderson, microbiology and plant pathology
Edmund D. Brodie, Jr., behavior and evolution
E. W. "Ted" Evans, insect ecology
James W. Haefner, systems analysis
Joseph K.-K. Li, virology
James A. MacMahon, community ecology
Frank J. Messina, insect biology
Keith A. Mott, plant physiology
William J. Pependorf, industrial hygiene
Peter C. Ruben, neurobiology
Jon Y. Takemoto, microbiology

Associate Professors

Brett A. Adams, cell signaling
Diane G. Alston, integrated pest management
Mary E. Barkworth, plant systematics
Daryll B. DeWald, cell biology
Timothy A. Gilbertson, neurobiology

Department of Biology

Bradley R. Kropp, mycology
Richard J. Mueller, plant morphology
Gregory J. Podgorski, developmental biology
John M. Stark, microbial ecology and biogeochemistry
Kimberly A. Sullivan, behavioral ecology
Carol D. von Dohlen, insect biology
Dennis L. Welker, molecular biology
Paul G. Wolf, systematics and molecular biology

Assistant Professors

Michelle A. Baker, aquatic ecology
Paul F. Cliften, microbial functional genomics
S. K. Morgan Ernest, spatial ecology
C. Kent Evans, extension plant pathology
Michael E. Pfrender, evolutionary quantitative genetics
Katarina Stroffekova, physiology

Professors Emeriti

William A. Brindley, entomology and toxicology
Donald W. Davis, entomology and pest management
Keith L. Dixon, ornithology and mammalogy
LeGrande C. Ellis, endocrinology and reproductive physiology
James A. Gessaman, vertebrate physiological ecology
Ting H. Hsiao, insect physiology and biochemistry
Gene W. Miller, plant biochemistry and physiology
Ivan G. Palmblad, evolutionary ecology
Frederick J. Post, aquatic microbiology and microbial ecology
Reed S. Roberts, entomology
Richard J. Shaw, vascular plant taxonomy
John R. Simmons, biochemical genetics
John J. Skujins, soil biochemistry and microbial ecology
Sherman V. Thomson, plant pathology
Nabil N. Youssef, cell biology and parasitology

Associate Professors Emeriti

David B. Drown, environmental health
Wilford J. Hansen, systematic entomology
Raymond I. Lynn, algology and microbial ecology
George W. Welkie, plant physiology and virology

Research Professor

Donald W. Roberts, insect pathology

Research Associate Professor

Vijendra K. Singh, immunology

Research Assistant Professors

Michelle A. Grilley, molecular biology
Dane R. Hansen, molecular biology, physiology, cell signaling
Joanne E. Hughes, molecular genetics
Charles D. Miller, plant pathology
Mark P. Miller, genetics
James P. Pitts, entomology

Adjunct Professors

James H. Cane, bee biology
Noelle E. Cockett, biotechnology
Robert Fogel, mycology
William P. Kemp, insect ecology
J. Russell Mason, predation, ecology, and behavior
Darwin L. Sorensen, aquatic microbiology
Rex S. Spindlove, virology

Adjunct Associate Professors

John C. Bailey, public health
Dale L. Barnard, chemotherapy of viruses
Jay B. Karren, entomology
Vincent J. Tepedino, entomology

Adjunct Assistant Professors

Terry Griswold, bee biology
Rosalind R. James, entomology
Theresa L. Pitts-Singer, entomology

Principal Lecturer

David M. "Andy" Anderson, medical technology

Lecturers

John A. Flores II, public health, industrial hygiene
Alice M. Lindahl, invertebrate biology
David O. Wallace, public health, industrial hygiene

Course Descriptions

Biology (BIOL), pages 466-470
Public Health (PUBH), pages 590-591

Department of Business Administration

Department Head: Alan A. Stephens

Location: Business 811

Phone: (435) 797-2362

FAX: (435) 797-2634

E-mail: alan.stephens@usu.edu

WWW: <http://www.usu.edu/cob/admin>

Undergraduate Advisor:

Isobel Roskelley, Business 309, (435) 797-2272,

isobel.roskelley@usu.edu

Degrees offered: Bachelor of Science (BS) and Bachelor of Arts (BA) in Business Administration, Finance, Marketing, and Operations Management. The Department of Business Administration participates in the College of Business MBA (Master of Business Administration) degree (see pages 178-179).

Undergraduate Programs

Objectives

The Department of Business Administration offers programs to prepare students for administrative positions in business, government, and other institutions. Specialized training is provided within specific functional fields of business, as well as training directed at understanding the broader aspect of business as it functions within our economy. Training is specifically provided in three areas: (1) **Finance**, leading to careers in banking, brokerage activities and investment, and positions as financial analysts in industry; (2) **Marketing**, involving positions in sales, advertising, retailing, distribution, and other similar activities; and (3) **Operations Management**, leading to careers related to supply chain management, operations planning and scheduling, project management, quality management, and consulting.

Departmental Honors

See *Honors in Business* description in the College of Business section of this catalog (page 105).

Learning Objectives and Assessment

Assessment information for the Business Administration Department can be found online at:

<http://www.usu.edu/cob/admin/dept/assess.htm>

College of Business Requirements

All students desiring to major in the Business Administration Department must satisfy the College of Business admission requirements, provided on pages 105-106. Academic advising about these requirements is available in the College of Business Career and Education Opportunities Center, Business 309.

Matriculation Requirement and Transfer Limitation

No more than 15 USU College of Business credits (ACCT, BA, BIS, BUS, MHR), numbered 2000 and above, earned as a nonbusiness major (before acceptance into the College of Business) can be applied to a College of Business degree. More than 15 business credits can be transferred from other accredited institutions. However, additional USU College of Business credits added to previously earned transfer business credits may not exceed a combined total of 15. Furthermore,

to earn a bachelor's degree in a College of Business major, at least 50 percent of the required College of Business credits must be earned from coursework taken from the Utah State University College of Business.

USU Credits and Business Credits

At least 30 of the last 60 semester credits must be taken from Utah State University, 10 of which must be included within the last 40 credits presented for the degree. At least 50 percent of the College of Business credits required for a College of Business degree must be taken from the Utah State University College of Business or its departments, which include: School of Accountancy, Business Administration, Business Information Systems, Economics, and Management and Human Resources.

Business Core

All majors in the Department of Business Administration must complete the following prerequisite courses and business core courses in addition to the specific courses listed for the major.

Prerequisite Courses (13 credits)

ECON 1500 (BAI) Introduction to Economic Institutions, History, and Principles (F,Sp)	3
MATH 1100 (QL) Calculus Techniques (F, Sp, Su)	3
STAT 2300 (QL) Business Statistics (F, Sp, Su)	4
PSY 1010 (BSS) General Psychology (F, Sp, Su) (3 cr) or	
SOC 1010 (BSS) Introductory Sociology (F, Sp) (3 cr)	3

Business majors must take the above courses as prerequisite to 3000-, 4000-, and 5000-level courses in the College of Business.

College of Business Core (37 credits)

ACCT 2010 Survey of Accounting I (F, Sp, Su)	3
ACCT 2020 Survey of Accounting II (F, Sp, Su)	3
BA 3400 (QI) Corporate Finance (F, Sp, Su)	3
BA 3500 Fundamentals of Marketing (F, Sp, Su)	3
BA 3700 Operations Management (F, Sp, Su)	3
BIS 2450 Spreadsheets and Databases for Business (F, Sp, Su)	3
BIS 2550 (CI) Business Communication (F, Sp, Su)	3
BUS 3250 Discussions With Business Leaders (F, Sp)	1
ECON 2010 (BSS) Introduction to Microeconomics (F, Sp)	3
ECON 3400 International Economics for Business (F, Sp, Su)	3
MHR 2990 Legal and Ethical Environment of Business (F, Sp, Su)	3
MHR 3110 Managing Organizations and People (F, Sp, Su)	3
MHR 4880 (CI) Business Strategy in an Entrepreneurial Context (F, Sp) (3 cr) or	
MHR 4890 (CI) Business Strategy in a Global Context (F, Sp, Su) (3 cr)	3

All 3000-, 4000-, and 5000-level courses in the College of Business are restricted to students admitted to the College of Business or another USU major with an overall GPA of at least 2.67 and completion of at least 40 credits.

Majors

The Department of Business Administration offers four majors. An overall GPA of at least 2.50 is required to graduate. Course requirements for each major are listed on the following pages.

Finance Major Requirements (21 credits)

Finance is concerned with how individuals and firms allocate resources over time. Solutions to allocation problems rely upon the existence of capital markets that allow the exchange of resources over time,

Department of Business Administration

and firms that allow individuals to transform current resources into resources available in the future. In particular, finance deals with the financial management of firms, investment management, and the management of financial institutions.

Required Courses (12 credits)

BA 4450 Financial Policy (F,Sp)	3
BA 4460 Investments (F,Sp)	3
ECON 4010 Managerial Economics (F,Sp,Su)	3
ECON 4020 Macroeconomics for Managers (F,Sp,Su)	3

Electives (9 credits)

Three electives are required, two of which must be selected from the following list:

BA 4300 International Finance (F,Sp)	3
BA 4410 Financial Institutions (F,Sp)	3
BA 4420 Insurance (F)	3
BA 4430 Real Estate Finance (Sp)	3

The remaining elective may be chosen from the following, or from the list above:

ACCT 3310 Strategic Cost Management (F,Sp,Su)	3
ACCT 3410 Income Taxation I (F,Sp,Su)	3
BA 3080 (QI) Operations Research (F,Sp)	3
ECON 4030 (CI) Agribusiness Finance (F)	3
ECON 5030 Agricultural Marketing and Price Analysis (F)	3
ECON 5330 (QI) Applied Econometrics (Sp)	3
ECON 5600 Financial Economics (Sp)	3
PFP 5060 Personal Financial Planning and Advising (F)	3
PFP 5070 Retirement Planning (Sp)	3
PFP 5080 Estate Planning (Sp)	3

Marketing Major Requirements (21 credits)

Modern marketing consists of a system of activities designed to help the marketer understand and influence buyer and seller behavior. Within the socio-economic and political environment, the marketer must plan, price, promote, and distribute want-satisfying goods and services to society. As prerequisites to BA 4590, students must complete two of the following courses: BA 4510, 4530, 4540, or 4550.

Required Courses (15 credits)

BA 4510 Buyer Behavior (F,Sp)	3
BA 4530 Marketing Research (F,Sp)	3
BA 4540 Marketing Institutions (F,Sp) (3 cr) or	
BA 4070 (CI) Retail Management (3 cr)	3
BA 4550 Promotion Management (F,Sp)	3
BA 4590 Global Marketing Strategy (F,Sp)	3

Elective Courses (6 credits)

Select one of the following marketing tracks:

Track 1: Analysis of Culture

Option A: Language

LING 4100 The Study of Language (F, Sp)	3
LING 4900 Analysis of Cross-Cultural Difference (Sp)	3

Option B: Psychology

PSY 4210 Personality Theory (Sp)	3
PSY 4240 Multicultural Psychology (F)	3

Option C: Social Systems

MHR 4630 Human Resource Management (F, Sp)	3
MHR 4730 Business and Society (F, Sp)	3

Option D: Social/Environmental (Choose 2 courses)

MHR 4730 Business and Society (F, Sp)	3
ENVS 3330 Environment and Society (Sp)	3
ENVS 4000 Human Dimensions of Natural Resource Management (F)	3
LAEP 4900 Special Problems (F, Sp, Su)	3

Track 2: Communication (Choose 2 courses)

BIS 4550 (CI) Principles of International Business Communications (Sp)	3
JCOM 4010 Mass Communication Ethics (Sp)	3
JCOM 4020 Mass Media and Society (F, Sp)	3
SPCH 4800 (CI) Nonverbal Communication (F)	3

Track 3: International (Choose 2 courses)

BA 4050 International Retailing	3
BIS 4550 (CI) Principles of International Business Communications (Sp)	3
POLS 3100 Global Issues (F)	3

Track 4: Recreation/Tourism (Choose 2 courses)

ENVS 3300 Fundamentals of Recreation Resources Management (F)	3
ENVS 4130 Recreation Policy and Planning (Sp)	3
ENVS 4500 (CI) Wildland Recreation Behavior (Sp)	3
PRP 3750 Commercial Recreation and Tourism (F)	3
PRP 4400 Recreation Park and Facility Management (F)	3

Track 5: Operations and Distribution

BA 4720 Production Planning and Control (F)	3
BA 4790 Supply Chain Management (Sp)	3

Track 6: Research (Choose 2 courses)

ECON 4010 Managerial Economics (F, Sp, Su)	3
ECON 4310 (QI) Mathematical Methods for Economics (F)	3
STAT 3000 (QI) Statistics for Scientists (F, Sp)	3

Track 7: Retail (Choose 2 courses)

BA 4240 Merchandise Planning and Control	3
BIS 5450 Designing Graphical User Interfaces for Electronic Commerce (F,Sp)	3
BIS 5700 Internet Management and Electronic Commerce (F,Sp)	3

Operations Management Major Requirements (21 credits)

Operations management involves planning, directing, controlling, and improving the activities related to providing goods and services. The operations manager is responsible for assuring that customer expectations are met, and even exceeded, with regard to quality, delivery, and price. To execute their responsibilities, operations managers must understand how to convert customer demand into specific material, equipment, and labor resources. In addition, they must work with and develop good suppliers, customer relationships, and internal work activities.

Required Courses (18 credits)

BA 3080 (QI) Operations Research (F,Sp)	3
BA 4720 Production Planning and Control (F)	3
BA 4750 Production Simulation (Sp)	3
BA 4790 Supply Chain Management (Sp)	3
BA 5730 Process Analysis and Improvement (F)	3
MAE 5600 Manufacturing Process Planning and Statistical Quality Control (F) (3 cr) or	
STAT 5300 (QI) Statistical Process Control (Sp) (3 cr)	3

Department of Business Administration

Elective Course (3 credits)

Select one of the following two courses:

ACCT 3310 Strategic Cost Management (F,Sp,Su)	3
MHR 4630 Human Resource Management (F,Sp)	3

Business Administration Major Requirements

The Business Administration major is a general degree that recognizes that most business students will have multiple business responsibilities throughout their career. This degree provides broad cross-discipline experience in the core business areas of operations, finance, and marketing. A written proposal is designed by the student and submitted to the department head for approval. This proposal will include a written justification and a list of courses totaling at least 21 credits. For instructions, students should contact the departmental advisor.

Required Courses (18 credits)

BA 4410 Financial Institutions (F, Sp)	3
BA 4450 Financial Policy (F, Sp)	3
BA 4530 Marketing Research (F, Sp)	3
BA 4590 Global Marketing Strategy (F,Sp)	3
BA 4790 Supply Chain Management (Sp)	3
BA 5730 Process Analysis and Improvement (F)	3

Required Capstone Course (3 credits)

MHR 4880 (CI) Business Strategy in an Entrepreneurial Context (F, Sp) (3 cr) or	
Another approved course (3 cr)	3

Students choosing the MHR 4880 option must take MHR 4890 to satisfy the business core requirement.

Minor Requirements

The Department of Business Administration offers three minors: a marketing minor, a finance minor, and an operations management minor.

A student from outside the College of Business who desires to pursue any of these minors must recognize that there are several prerequisites to the required courses. Specifically, most of the courses require college algebra; some require accounting, economics, or statistics.

Marketing Minor (16 credits)

Required Courses (10 credits)

BA 3500 Fundamentals of Marketing (F, Sp, Su)	3
MHR 3110 (DSS) Managing Organizations and People (F, Sp)	3
STAT 2300 (QL) Business Statistics (F, Sp, Su)	4

Electives (6 credits)

Select two of the following courses:

BA 4510 Buyer Behavior (F, Sp)	3
BA 4530 Marketing Research (F, Sp)	3
BA 4540 Marketing Institutions (F, Sp)	3
BA 4550 Promotion Management (F, Sp)	3

Finance Minor (15 credits)

Required Courses (12 credits)

BA 3400 (QI) Corporate Finance (F, Sp, Su)	3
BA 3500 Fundamentals of Marketing (F, Sp, Su)	3
BA 4450 Financial Policy (F, Sp)	3
BA 4460 Investments (F, Sp)	3

Elective Course (3 credits)

Select one of the following courses:

BA 4300 International Finance (F, Sp)	3
---------------------------------------	---

BA 4410 Financial Institutions (F, Sp)	3
BA 4420 Insurance (F)	3
BA 4430 Real Estate Finance (Sp)	3

Operations Management Minor (15 credits)

Required Courses (9 credits)

BA 3500 Fundamentals of Marketing (F, Sp, Su)	3
BA 3700 Operations Management (F, Sp, Su)	3
BA 4720 Production Planning and Control (F)	3

Electives (6 credits)

Select two of the following courses:

BA 3080 (QI) Operations Research (F, Sp)	3
BA 4750 Production Simulation (Sp)	3
BA 4790 Supply Chain Management (Sp)	3
BA 5730 Process Analysis and Improvement (F)	3

A grade point average of at least 2.50 over the minor courses is required.

A student may request a deviation from the preceding requirements by submitting a written justification for the changes to the department head for approval. If approved, it becomes the minor for that student only.

Business Minor (General)

A general Business Minor is administered by the College of Business. For further information, students should contact the College of Business Career and Education Opportunities Center, Business 309, (435) 797-2272.

Other Degree Options

Dual Majors

Dual majors are available in accounting, human resources, management, business information systems, and economics. See the applicable department for information.

Second Bachelor's Degrees

Second bachelor's degrees are available for all four majors. For information, contact the College of Business Career and Education Opportunities Center, Business 309.

Additional Information

Advising sheets for majors, minors, second bachelor's degrees, and the Business Administration major are available from the Department of Business Administration, Business 815, and from the College of Business Career and Education Opportunities Center, Business 309. These sheets can also be found online at:

<http://www.usu.edu/cobssc/web/requirementsheets.htm>

A major requirement sheet, which includes further information about career opportunities and course requirements for the majors and minors within the Business Administration Department, can be obtained from the department, or accessed online at:

<http://www.usu.edu/ats/majorsheets/>

Graduate Programs

For information about the **Interdepartmental Curriculum for the Master of Business Administration (MBA)**, see pages 178-179.

Master's degrees are also offered by the following departments in the

Department of Business Administration

College of Business: Accountancy, Business Information Systems, and Economics. For further information, refer to the appropriate sections of this catalog.

Business Administration Faculty

Professors Emeritus

Allen D. Kartchner, production and operations research
Eugene C. Kartchner, production and operations research
Paul A. Randle, corporate finance and valuation analysis

Professors

Kenneth R. Bartkus, promotion management
Drew Dahl, financial institutions and international finance
Peter M. Ellis, production and operations research
J. Robert Malko, corporate and energy utility finance
C. R. Michael Parent, marketing research and strategy
Philip R. Swensen, corporate finance, investments, and managerial economics

Associate Professors

J. Brian Atwater, "theory of constraints," quality management, lean manufacturing

Cathy L. Hartman, consumer behavior and environmental sustainability
Vijay R. Kannan, supply chain and quality management, cellular manufacturing
Edwin R. Stafford, marketing management, strategy, environmental sustainability
Alan A. Stephens, corporate finance and investments

Assistant Professors

Stacey B. Hills, marketing research, strategy, and product management
Haiyan Hu, retailing and consumer behavior, international retailing, visual merchandising and promotion
Seung-Woog Kwag, investments and corporate finance

Senior Lecturer/Executive in Residence

Randall L. Cook, operations management and finance

Lecturer

Janet P. Lyons, operations and marketing

Course Descriptions

Business Administration (BA), pages 471-473

Master of Business Administration (MBA)

Director of Business Graduate Programs: Mary Jo Blahna

Location: Business 809

Phone: (435) 797-2360

FAX: (435) 797-2634

E-mail: maryjo.blahna@usu.edu

WWW: <http://www.usu.edu/mba/>

Degree Offered: Master of Business Administration (MBA)

Graduate Specializations: Accounting, Entrepreneurship, Human Resource Management, Manufacturing Management, Personal Financial Planning

Graduate Program

Objectives

The MBA program is an interdepartmental program administered by the College of Business. The MBA program is designed to provide students with an understanding of analytical tools necessary for effective and efficient management in today's complex business world. The curriculum prepares students with a working knowledge of the fundamental business functions and a sensitivity to the legal, ethical, social, technological, and international forces in the business environment. The MBA program's focus is the development of the analytical, communication, interpersonal, and leadership skills needed for a successful career in a variety of organizations. The MBA program is accredited by AACSB International—The Association to Advance Collegiate Schools of Business.

Admission Requirements

For consideration for admission to the MBA program, applicants must submit an application form and fee, all undergraduate transcripts, Graduate Management Admissions Test (GMAT) scores (the GRE is also accepted), and three letters of recommendation from qualified professionals. TOEFL scores are required for candidates from abroad, with a minimum of 213 computerized or 550 paper/pencil deemed acceptable. International students with a prior degree from an English-speaking university are exempt from the TOEFL exam.

Application Deadline for Fall Semester

No application will be considered until all required information arrives in the School of Graduate Studies at Utah State University. In addition, the student desiring to pursue the MBA degree must have been accepted as a matriculated student before he or she will be permitted to register for 6000-level courses that will be part of the student's advanced program. Full-time business experience is also preferred, but not required. Students who wish to be considered for financial aid must submit applications by **February 15** for the coming academic year.

Students with or without an undergraduate degree in business may enter the MBA program. However, before taking advanced courses, basic competencies in business that have not been acquired through prior courses or experience must be met. Applicants not meeting minimum requirements may be allowed to correct deficiencies concurrently with graduate coursework. Before entering the program, each student must meet with an advisor to plan his or her course of study.

Degree Requirements

Business Core

The MBA Business Core curriculum provides skills and knowledge in statistics, written communication, computer literacy, mathematics, information systems, economics, accounting, finance, marketing, management, and organizational behavior. Students who have completed a bachelor's degree must have coursework which includes learning experiences in management-specific areas recommended by AACSB—International for direct entry into the advanced program.

Accelerated Business Core

Students who have not completed a bachelor's degree accredited by AACSB International may choose to gain the necessary basic business competencies by attending the Accelerated Business Core (ABC). The ABC is a uniquely efficient and effective way of delivering the basic program curriculum in a compressed format during the summer semester. The ABC enables students from nonbusiness backgrounds to prepare quickly for the Advanced Program Courses.

Alternatively, students may acquire the necessary basic competencies by completing courses satisfying the following management-specific knowledge and skills requirement: ACCT 2010, 2020; BA 3400, 3500, 3700; ECON 1500, 2010; MHR 2990, 3110; MATH 1100; and STAT 2300. Students may not be required to take courses which duplicate prior academic or industrial training. Students must meet with the director of the MBA program to plan their course of study.

The advanced program courses, along with electives, consist of 33 credits. Students must complete the advanced program course requirements listed below. In addition, students may choose to select among several specializations, which are also described below. A specialization requires the student to complete additional courses beyond the 33 credits.

Advanced Program Courses (33 credits)

Students must complete the following six courses: ACCT 6350; BA 6420, 6520, 6720; and MHR 6500, 6890. Additionally, students must complete one course each in information systems (e.g., ACCT 6500), research methods (e.g., BUS 6860), quantitative analysis (e.g., ECON 6330), and business ethics (e.g., MHR 6770). These courses must be selected in consultation with the MBA program director. Also, students are required to attend a professional development program (BUS 6310) that begins in August before the start of classes and continues throughout the MBA program.

Specializations (12 credits)

Students may select a specialization in one of several areas listed below. Classes taken as part of the MBA advanced program courses cannot be used as part of a specialization. One course in each specialization will be designated as research intensive to meet the research methods requirement.

Accounting

To qualify for this specialization, students must complete, or have previously completed, the equivalent of ACCT 3110, 3120, 3310, 3410, 5210 (or 6210), 5220 (or 6220), 5400 (or 6400), and 6510. At least 9 credits must be taken in accounting courses numbered above 6010. The research methods requirement may be satisfied by completing ACCT 6410 or 6610.

Master of Business Administration (MBA)

Entrepreneurship

This specialization consists of MHR 6410, 6430, 6470, and an approved elective.

Human Resource Management

This specialization requires students to complete MHR 6690 and to select any three of the following courses: MHR 6550, 6620, 6630, 6640, 6670, and 6760.

Manufacturing Management

This specialization includes BA 5730, 6740; and MHR 6350, 6370.

Personal Financial Planning

This specialization consists of PFP 6060, 6070, 6080, and an approved elective. Students must have completed (or complete as part of their graduate work): BA 3460 or 4460, and ACCT 3410. This specialization satisfies requirements to sit for the national Certified Financial Planner (CFP) examination.

Financial Assistance

Graduate assistantships, scholarships, and fellowships are available to outstanding on-campus students. Graduate assistantships and scholarships generally range between \$1,000 and \$3,000 for nine months. Application for financial aid must be made by **February 15**. A recipient of a graduate assistantship is usually eligible for a waiver of the out-of-state portion of his or her tuition.

Master of Business Administration Faculty

Professors

Kenneth R. Bartkus, promotion management
Caryn L. Beck-Dudley, business law and social responsibility
Basudeb Biswas, international trade and economic development
Gaylen N. Chandler, human resources, management, and entrepreneurship
Drew Dahl, financial institutions
Peter M. Ellis, production and operations research
Christopher Fawson, public finance and econometrics
L. Dwight Israelsen, comparative systems and economic history
Paul M. Jakus, economics
Richard L. Jenson, information systems and managerial accounting
I. Richard Johnson, financial, managerial, advanced, and agency accounting

J. Robert Malko, corporate and energy utility finance
Glenn M. McEvoy, organizational behavior, human resources, and management
C. R. Michael Parent, marketing research and strategy
Richard L. Ratliff, auditing, financial, internal audit, and principles
Clifford R. Skousen, international and managerial accounting
David B. Stephens, business strategy and labor relations
Philip R. Swensen, finance

Associate Professors

J. Brian Atwater, "theory of constraints," quality manufacturing, lean manufacturing
Ronda R. Callister, organization behavior, management
Cathy L. Hartman, consumer behavior and environmental sustainability
Jeffrey J. Johnson, information systems
Vijay R. Kannan, supply chain and quality management, cellular manufacturing
Irvin T. Nelson, accounting
David H. Olsen, database manager
David J. Paper, web development
Edwin R. Stafford, marketing
Alan A. Stephens, corporate finance and investments

Assistant Professors

Alison Cook, organizational behavior, human resource management
Dawn DeTienne, entrepreneurship
E. Vance Grange, accounting
James Hayton, human resources
Haiyan Hu, retailing and consumer behavior, international retailing, visual merchandising and promotion
Stacey B. Hills, marketing research, strategy, and product management
Yong Seog Kim, e-commerce, information systems strategies
Seung-Woog Kwag, finance
Robert J. Mills, visual basic
Troy V. Mumford, organizational behavior, human resource management, compensation
Jean A. Pratt, e-commerce/web design

Executive-in-Residence/Principal Lecturer

Alan P. Warnick, human resources

MBA Courses

Descriptions of MBA courses can be found in the *Course Descriptions* section of this catalog.

Department of Business Information Systems

Department Head: Karen A. Forcht

Location: Business 711

Phone: (435) 797-2342

FAX: (435) 797-2351

E-mail: karen.forcht@usu.edu

WWW: <http://www.usu.edu/cob/bis/>

Undergraduate Advisor:

Peggy Buttars, Business 309, (435) 797-2272,

peggy.buttars@usu.edu

Degrees offered: Bachelor of Science (BS), Bachelor of Arts (BA), and Master of Science (MS) in Business Information Systems; BS and BA in Business Information Technology and Education; BS and BA in Marketing Education; Master of Education (MEd) in Secondary Education with specialization in Business Education; participates in the Interdepartmental Doctor of Philosophy (PhD) in Education and Doctor of Education (EdD) with a specialization in Business Information Systems

Undergraduate emphases: *Business Information Systems BS, BA*—Management Information Systems, Electronic Commerce; *Business Information Technology and Education BS, BA*—Business Teacher License, Training and Development; *Marketing Education BS, BA*—Marketing Teacher License, Training and Development

Graduate specializations: *Business Information Systems MS*—Business Education, Business Information Systems, Electronic Commerce, Management Information Systems, Marketing Education, and Training and Development. The MS in Business Information Systems is also offered through Distance Learning. For more information, contact the nearest USU Extension Center.

Undergraduate Programs

Objectives

The Department of Business Information Systems offers two major educational thrusts in undergraduate as well as graduate programs. The Business Information Systems major is designed to prepare individuals for positions as managers in business information systems, including information managers, information supervisors, network managers, worldwide web designers, electronic commerce developers, systems analysts, applications programmers, systems trainers, and office systems managers by pursuing a bachelor's degree program in Business Information Systems.

The second major thrust is designed to prepare individuals as teachers and supervisors of business and marketing subjects at the secondary and postsecondary grade levels in the educational system or as teacher-trainers in private industry. Students may earn a bachelor's degree in Business Information Technology and Education or Marketing Education.

Departmental Honors

See *Honors in Business* description in the College of Business section of this catalog (page 105).

Learning Objectives and Assessment

Assessment information for the Business Information Systems Department can be found online at:
<http://www.usu.edu/cob/bis/about/assessment.htm>

Requirements

College of Business Requirements

All bachelor's degree students majoring in Business Information Systems programs must satisfy the College of Business entrance requirements provided on pages 105-106. Academic advising about these requirements is provided by the College of Business Career and Education Opportunities Center, Business 309. Business Information Systems majors must also follow College of Business prebusiness course requirements for admission to a major, detailed on page 106.

Matriculation Requirement and Transfer Limitation

No more than 15 USU College of Business credits (ACCT, BA, BIS, BUS, MHR), numbered 2000 and above, earned as a nonbusiness major (before acceptance into the College of Business) can be applied to a College of Business degree. More than 15 business credits can be transferred from other accredited institutions. However, additional USU College of Business credits added to previously earned transfer business credits may not exceed a combined total of 15. Furthermore, to earn a bachelor's degree in a College of Business major, at least 50 percent of the required College of Business credits must be earned from coursework taken from the Utah State University College of Business.

USU Credits and Business Credits

At least 30 of the last 60 semester credits must be taken from Utah State University, 10 of which must be included within the last 40 credits presented for the degree. At least 50 percent of the College of Business credits required for a College of Business degree must be taken from the Utah State University College of Business or its departments, which include: School of Accountancy, Business Administration, Business Information Systems, Economics, and Management and Human Resources.

Teacher Licensure

Persons planning to teach must also be admitted to the teacher licensure program in the College of Education and Human Services. A cumulative college grade point average of 2.75 is required to be admitted to the College of Education and Human Services, to student teach, and to graduate in Business Information Technology and Education or Marketing Education with a teaching license. Detailed information may be obtained from the Department of Secondary Education and/or the College of Education and Human Services.

Competency-based Placement Program

Students who have acquired knowledge and skills that are not represented on their collegiate transcripts of credit are allowed to demonstrate competency by challenging related courses. Placement in a skills-oriented sequence can be accomplished by discussion with an advisor. Challenge of courses is done by successfully completing an examination similar to a final course test.

Students with potential for demonstrating competence have two options, one of which must be chosen prior to examination. One option is to challenge for credit (*P/D+*, *D*, *F* option) according to University established procedures; results of the test are recorded on the student's transcript. A second option is to waive without credit required classes, if competence at the *B* level is demonstrated. Students will be assessed a fee for choosing one of these options.

Department of Business Information Systems

Program Requirements

Bachelor's Degree in Business Information Systems

The Information Systems program at Utah State University offers a common core of courses through two departmental majors: **Business Information Systems** and **Computer Science**. The curricula of the individual departments differ *substantially* in emphasis.

The **Business Information Systems major, Management Information Systems (MIS) emphasis**, is offered in the Business Information Systems Department, College of Business. The Bachelor of Science or Bachelor of Arts program is designed for students interested in business careers as information specialists, systems analysts, network managers, applications programmers, and information systems managers in business and industry. BIS majors take required courses in analysis and design, Internet management, telecommunications, decision support systems, spreadsheet and database applications, and information systems projects. All graduates are required to complete a common core of business subjects. The College of Business is accredited by AACSB International—The Association to Advance Collegiate Schools of Business. The department also offers a Master of Science in Business Information Systems with an area of emphasis in Management Information Systems.

The **Computer Science major with an Information Systems emphasis** is located in the College of Science and is designed for students interested in a career as a Computer Scientist with a background in Information Sciences and Systems. Majors in this emphasis are trained in all phases of the analysis, design, and implementation of Information Systems. As part of this emphasis, students also receive training in the theory and application of information. Students select an application area such as Business, Accounting, or Economics. Other application areas can be developed by working closely with an advisor. This program of study leads to a Bachelor of Science, Bachelor of Arts, or Master of Science degree in Computer Science. See pages 209 and 211 for additional details.

Pre-Business Course Requirements (13 credits)

ECON 1500 (BAI) Introduction to Economic Institutions, History, and Principles (F,Sp)	3
MATH 1100 (QL) Calculus Techniques (F, Sp, Su)	3
STAT 2300 (QL) Business Statistics (F, Sp, Su)	4
PSY 1010 (BSS) General Psychology (F, Sp, Su) (3 cr) or	
SOC 1010 (BSS) Introductory Sociology (F, Sp) (3 cr)	3

College of Business Core (37 credits)

ACCT 2010 Survey of Accounting I (F, Sp, Su)	3
ACCT 2020 Survey of Accounting II (F, Sp, Su)	3
BA 3400 (QI) Corporate Finance (F, Sp, Su)	3
BA 3500 Fundamentals of Marketing (F, Sp, Su)	3
BA 3700 Operations Management (F, Sp, Su)	3
BIS 2450 Spreadsheets and Databases for Business (F, Sp, Su)	3
BIS 2550 (CI) Business Communication (F, Sp, Su)	3
BUS 3250 Discussions With Business Leaders (F, Sp)	1
ECON 2010 (BSS) Introduction to Microeconomics (F, Sp)	3
ECON 3400 International Economics for Business (F, Sp, Su)	3
MHR 2990 Legal and Ethical Environment of Business (F, Sp, Su)	3
MHR 3110 Managing Organizations and People (F, Sp, Su)	3
MHR 4880 (CI) Business Strategy in an Entrepreneurial Context (F, Sp) (3 cr) or	
MHR 4890 (CI) Business Strategy in a Global Context (F, Sp, Su) (3 cr)	3

Students must choose an **Electronic Commerce** emphasis, or a **Management Information Systems (MIS)** emphasis.

The **electronic commerce emphasis** provides knowledge and skills for students who wish to work in the electronic economy using high-speed Internet networks and applications, while providing competitive tools for all Internet-driven electronic commerce. This expertise includes business-to-business electronic commerce, as well as business-to-consumer electronic commerce. Students gain expertise in establishing and designing websites from the technical point of view, as well as expertise in electronic commerce from a strategic business point of view.

Electronic Commerce Emphasis (41-44 credits, plus electives)

Required Courses (29 credits)

BIS 3330 Database Management (F, Sp, Su)	3
BIS 4330 Database Implementation (F,Sp)	3
BIS 5050 Advanced Web-Based Management Information Systems Development (F, Sp, Su)	3
BIS 5100 Systems Design and Implementation (F,Sp)	3
BIS 5110 Systems Design Laboratory (F,Sp)	1
BIS 5300 Advanced Data Communications (F,Sp)	3
BIS 5450 Designing Graphical User Interfaces for Electronic Commerce (F,Sp)	3
BIS 5650 Advanced Website Development (F, Sp, Su)	3
CS 1700 Introduction to Computer Science—CS 1 (F, Sp, Su)	3
CS 1710 Introduction to Computer Science—CS 1 Lab (F, Sp, Su)	1
CS 1720 (QI) Introduction to Computer Science—CS 2 (F, Sp, Su) (3 cr) or	
CS 3410 (CI/DSC) Algorithm Development: JAVA/Internet (F,Su) (3 cr)	3

Major Requirements (12-15 credits)

BIS 1400¹ Microcomputer Applications in Business (F, Sp, Su) (3 cr) or Passing grade on Computer and Information Literacy competency exam (0 cr)	0-3
BIS 3500 Management Information Systems Development (F, Sp, Su)	3
BIS 5700 Internet Management and Electronic Commerce (F,Sp)	3
BIS 5800 Security of Business Information Systems (F, Sp, Su)	3
BUS 4250 Advanced Internship (pre-approval required) (F, Sp, Su)	3

The **management information systems emphasis** provides knowledge and skills for business systems analysts, applications programmers, information managers, webmasters, and other business information systems positions.

Management Information Systems Emphasis (38-41 credits, plus electives)

Required Courses (23 credits)

CS 1700 Introduction to Computer Science—CS 1 (F, Sp, Su)	3
CS 1710 Introduction to Computer Science—CS 1 Lab (F, Sp, Su)	1
CS 1720 (QI) Introduction to Computer Science—CS 2 (F, Sp, Su) (3 cr) or	
CS 3410 (CI/DSC) Algorithm Development: JAVA/Internet (F,Su) (3 cr) or	
CS 3510 (QI/DSC) Algorithm Development: COBOL/Business (F) (3 cr)	3
BIS 3330 Database Management (F, Sp, Su)	3
BIS 4330 Database Implementation (F,Sp)	3
BIS 5100 Systems Design and Implementation (F,Sp)	3
BIS 5110 Systems Design Laboratory (F,Sp)	1
BIS 5300 Advanced Data Communications (F,Sp)	3
BIS 5400 Local Area Network Management for Business (F, Sp)	3

Department of Business Information Systems

Major Requirements (15-18 credits)

BIS 1400¹ Microcomputer Applications in Business (F, Sp, Su) (3 cr) or Passing grade on Computer and Information Literacy competency exam (0 cr)	0-3
BIS 2300 Business Data Communications and Networking (F, Sp, Su) (3 cr) or	
BIS 3100 Business Information Systems (F, Sp, Su) (3 cr)	3
BIS 3500 Management Information Systems Development (F, Sp, Su)	3
BIS 5050 Advanced Web-Based Management Information Systems Development (F, Sp, Su) (3 cr) or	
BIS 5650 Advanced Website Development (F, Sp, Su) (3 cr) or	
BIS 5700 Internet Management and Electronic Commerce (F,Sp) (3 cr)	3
BIS 5800 Security of Business Information Systems (F, Sp, Su)	3
BUS 4250 Advanced Internship (pre-approval required) (F, Sp, Su)	3

Bachelor's Degree in Business Information Technology and Education

A composite major in Business Information Technology and Education is designed for students desiring to qualify for a license to teach business subjects in grades 7-12 or to teach in business and industry. Required courses include:

Pre-Business Course Requirements (13 credits)

ECON 1500 (BAI) Introduction to Economic Institutions, History, and Principles (F,Sp)	3
MATH 1100 (QL) Calculus Techniques (F, Sp, Su)	3
STAT 2300 (QL) Business Statistics (F, Sp, Su)	4
PSY 1010 (BSS) General Psychology (F, Sp, Su) (3 cr) or	
SOC 1010 (BSS) Introductory Sociology (F, Sp) (3 cr)	3

College of Business Requirements (15 credits)

ACCT 2010 Survey of Accounting I (F, Sp, Su)	3
ACCT 2020 Survey of Accounting II (F, Sp, Su)	3
BIS 2450 Spreadsheets and Databases for Business (F, Sp, Su)	3
BIS 2550 (CI) Business Communication (F, Sp, Su)	3
MHR 2990 Legal and Ethical Environment of Business (F, Sp, Su)	3

Business Information Technology and Education Major Requirements¹ (30-33 credits)

BIS 1400 Microcomputer Applications in Business (F, Sp, Su) (3 cr) or Passing grade on Computer and Information Literacy competency exam (0 cr)	0-3
BIS 2300 Business Data Communications and Networking (F, Sp, Su) (3 cr) or	
BIS 3100 Business Information Systems (F, Sp, Su) (3 cr)	3
BIS 2400 Web Design for Business Applications (F, Sp, Su)	3
BIS 2520² Integrating Office Technology	3
FCHD 3350 (QI)³ Family Finance (F, Sp)	3
BIS 4550 (CI) Principles of International Business Communications (Sp)	3
BIS 5300 Advanced Data Communications (F,Sp) (3 cr) or	
BIS 5450 Designing Graphical User Interfaces for Electronic Commerce (F,Sp) (3 cr) or	
BIS 5700 Internet Management and Electronic Commerce (F,Sp) (3 cr)	3
BIS 5400 Local Area Network Management for Business (F, Sp)	3
BA 3500 Fundamentals of Marketing (F, Sp, Su)	3
BUS 2250 Introductory Internship (pre-approval required) (F, Sp, Su) .	3
MHR 3110 Managing Organizations and People (F, Sp)	3

¹Business Information Technology and Education majors may meet requirements for a Marketing Education minor by completing two of the following three courses, in addition to the requirements for the Business Information Technology and Education major: BIS 3550, Principles of Selling (online) (2 cr); BA 4510, Buyer Behavior (F,Sp) (3 cr); and BA 4550, Promotion Management (F,Sp) (3 cr).

²Prerequisites: BIS 1420 and 2550; or equivalent.

³FCHD 3350 meets the Quantitative Intensive University Studies Requirement.

Licensure Requirements (36 credits)

BIS 3000 Principles of Business and Marketing Education (F,Sp)	1
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Level 1 (15-week courses) (1st semester, Junior year)

SCED 3100 Motivation and Classroom Management (F, Sp)	3
SCED 3210 (CI) Educational and Multicultural Foundations (F, Sp)	3
BIS 3300 Clinical Experience I (40 hrs. minimum) (F,Sp)	1
BIS 3400 Methods of Teaching Keyboarding and Microcomputing (F and online)	3

Level 2 (15-week courses) (2nd semester, Junior year)

SPED 4000 Education of Exceptional Individuals (may be taken anytime) (F, Sp, Su)	2
SCED 4200 (CI) Reading, Writing, and Technology (F, Sp)	3
SCED 4210 Cognition and Evaluation of Student Learning (F, Sp)	3
BIS 4300 Clinical Experience II (40 hrs. minimum) (F,Sp)	1
BIS 4400 Business Education and Marketing Education Methods (Sp)	3

Level 3 (includes 13 weeks of student teaching and 2 weeks of Student Teaching Seminar) (1st semester, Senior year)

BIS 5500 Business/Marketing Teaching Seminar (2 wks.) (F,Sp)	2
BIS 5630 Business/Marketing Student Teaching (13 wks./full-time) (F,Sp)	10

Training and Development Emphasis (27 credits)

BIS 3450 Business Applications Using Visual Basic (F, Sp, Su)	3
BIS 4350 Introduction to Training and Development (Sp)	3
BIS 5450⁴ Designing Graphical User Interfaces for Electronic Commerce (F, Sp)	3
BUS 4250 Advanced Internship (pre-approval required) (F, Sp, Su)	3
Additional Training and Development Courses selected from the following list	15

Electives for Training and Development Emphasis

BIS 3330 Database Management (F, Sp)	3
MHR 3710 Developing Team and Interpersonal Skills (F, Sp)	3
INST 5210 Digital Audio-Video Production (F, odd Su)	3
INST 5230 Instructional Graphic Production (F, Su)	3
INST 5240 Producing Distance Education Resources (Sp, even Su) ...	3
INST 5250 Computer-Based Instruction Authoring Using Authorware (Sp, even Su)	3
INST 5260 Learning and Applying HTML (online)	3
INST 5300 Multimedia Production for Instruction and Training (Sp) ...	3
INST 5400 Computer Applications for Instruction and Training (online)	3
INST 5900 Independent Study: Current Software Application Seminar (F, Sp, Su)	3
MHR 4630 Human Resource Management (F, Sp)	3

⁴Students who have already taken BIS 5450 as part of the Business Information Technology and Education Major Requirements must take BIS 5300 or 5700 instead.

Those who do not wish to receive a license to teach in the public schools may select an emphasis in Training and Development for business and industry.

Bachelor's Degree in Marketing Education

A composite major in marketing education is designed for students desiring to qualify for a license to teach marketing and distributive education subjects in the public secondary schools or in business and industry. Required courses for students wishing to receive a license to teach include:

Department of Business Information Systems

College of Business Requirements (15 credits)

ACCT 2010 Survey of Accounting I (F, Sp, Su).....	3
ACCT 2020 Survey of Accounting II (F, Sp, Su).....	3
BIS 2450 Spreadsheets and Databases for Business (F, Sp, Su).....	3
BIS 2550 (CI) Business Communication (F, Sp, Su).....	3
MHR 2990 Legal and Ethical Environment of Business (F, Sp, Su).....	3

Marketing Education Requirements⁵ (30-33 credits)

BIS 1400 Microcomputer Applications in Business (F, Sp, Su) (3 cr) or Passing grade on Computer and Information Literacy competency exam (0 cr).....	0-3
BIS 1420 Word Processing Applications (F,Sp).....	3
BIS 2300 Business Data Communications and Networking (F, Sp, Su).....	3
BIS 2400 Web Design for Business Applications (F, Sp, Su).....	3
BIS 4550 (CI) Principles of International Business Communications (Sp).....	3
BA 3500 Fundamentals of Marketing (F, Sp, Su).....	3
BA 4510 Buyer Behavior (F,Sp).....	3
BA 4540 ⁷ Marketing Institutions (F,Sp) (3 cr) or BA 4550 Promotion Management (F,Sp) (3 cr).....	3
BUS 2250 Introductory Internship (pre-approval required) (F, Sp, Su).....	1-9
FCHD 3350 (QI) ⁶ Family Finance (F, Sp).....	3
MHR 3710 ⁷ Developing Team and Interpersonal Skills (F, Sp).....	3

⁵Marketing Education majors may meet requirements for a Business Information Technology and Education minor by completing the following courses, in addition to the requirements for the Marketing Education major: BIS 5300, Advanced Data Communications (3 cr) or BIS 5450, Designing Graphical User Interfaces for Electronic Commerce (3 cr) or BIS 5700, Internet Management and Electronic Commerce (3 cr); and BIS 5400, Local Area Network Management for Business (3 cr).

⁶FCHD 3350 meets the Quantitative Intensive University Studies Requirement.

⁷BUS 1120, Introduction to Apparel and Textiles (3 cr), and BA 4070, Retail Management (3 cr), may be substituted for BA 4540 and MHR 3710.

Licensure Requirements (36 credits)

BIS 3000 Principles of Business and Marketing Education (F,Sp).....	1
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Level 1 (15-week courses) (1st semester, Junior year)

SCED 3100 Motivation and Classroom Management (F, Sp).....	3
SCED 3210 (CI) Educational and Multicultural Foundations (F, Sp).....	3
BIS 3300 Clinical Experience I (40 hrs. minimum) (F,Sp).....	1
BIS 3400 Methods of Teaching Keyboarding and Microcomputing (F and online).....	3

Level 2 (15-week courses) (2nd semester, Junior year)

SPED 4000 Education of Exceptional Individuals (may be taken anytime) (F, Sp, Su).....	2
SCED 4200 (CI) Reading, Writing, and Technology (F, Sp).....	3
SCED 4210 Cognition and Evaluation of Student Learning (F, Sp).....	3
BIS 4300 Clinical Experience II (40 hrs. minimum) (F,Sp).....	1
BIS 4400 Business Education and Marketing Education Methods (Sp).....	3

Level 3 (includes 13 weeks of student teaching and 2 weeks of Student Teaching Seminar) (1st semester, Senior year)

BIS 5500 Business/Marketing Teaching Seminar (2 wks.) (F,Sp).....	2
BIS 5630 Business/Marketing Student Teaching (13 wks./full-time) (F,Sp).....	10

Training and Development Emphasis (27 credits)

BIS 3450 Business Applications Using Visual Basic (F, Sp, Su).....	3
BIS 4350 Introduction to Training and Development (Sp).....	3
BIS 5450 Designing Graphical User Interfaces for Electronic Commerce (F, Sp).....	3
BUS 4250 Advanced Internship (pre-approval required) (F, Sp, Su).....	3
Additional Training and Development Courses selected from the following list.....	15

Electives for Training and Development Emphasis

INST 5210 Digital Audio-Video Production (F, odd Su).....	3
INST 5230 Instructional Graphic Production (F, Su).....	3
INST 5240 Producing Distance Education Resources (Sp, even Su).....	3
INST 5250 Computer-Based Instruction Authoring Using Authorware (Sp, even Su).....	3
INST 5260 Learning and Applying HTML (online).....	3
INST 5300 Multimedia Production for Instruction and Training (Sp).....	3
INST 5400 Computer Applications for Instruction and Training (online).....	3
INST 5900 Independent Study: Current Software Application Seminar (F, Sp, Su).....	3
MHR 3710 Developing Team and Interpersonal Skills (F, Sp).....	3
MHR 4630 Human Resource Management (F, Sp).....	3

Graduation Requirements

To be recommended by the department for graduation with a bachelor's degree, BIS majors must have a minimum GPA of 2.67 in courses required for their major. Business Information Systems majors must have an overall GPA of 2.5. Business Information Technology and Education and Marketing Education majors must have an overall GPA of 2.75. This includes transfer credit. At least 50 percent of the business credits required for a business degree must be earned from coursework taken from the Utah State University College of Business.

Communications Literacy requirements are ENGL 1010 and 2010 plus two Communications Intensive courses.

Minors

The Department of Business Information Systems is authorized to award teaching minors in Business Information Technology and Education, Marketing Education, and Business Computer and Information Systems. A minor in Business Information Systems and a minor in Electronic Commerce are also authorized.

Business Information Technology and Education Teaching Minor (29-32 credits)

This is a **teaching minor**. Students must be working on a teaching license and must also teach in at least one business information technology and education class as part of their student teaching experience.

BIS 1400 Microcomputer Applications in Business (F, Sp, Su) (3 cr) or Passing grade on Computer and Information Literacy competency exam (0 cr).....	0-3
BIS 1420 Word Processing Applications (F, Sp).....	3
ECON 1500 (BAI) Introduction to Economic Institutions, History, and Principles (F, Sp).....	3
ACCT 2010 Survey of Accounting I (F, Sp, Su).....	3
BIS 2300 Business Data Communications and Networking (F, Sp, Su).....	3
BIS 2450 Spreadsheets and Databases for Business (F, Sp, Su).....	3
BIS 3000 Principles of Business and Marketing Education (F, Sp).....	1
BIS 3300 Clinical Experience I (F, Sp) (1 cr) or BIS 4300 Clinical Experience II (F, Sp) (1 cr).....	1
BIS 3400 Methods of Teaching Keyboarding and Microcomputing (F or online).....	3
BIS 4400 ⁸ Business Education and Marketing Education Methods (Sp).....	3
BIS 5300 Advanced Data Communications (F,Sp) (3 cr) or BIS 5450 Designing Graphical User Interfaces for Electronic Commerce (F, Sp) (3 cr) or BIS 5700 Internet Management and Electronic Commerce (F, Sp) (3 cr).....	3
BIS 5400 Local Area Network Management for Business (F, Sp, Su).....	3

⁸Prerequisites: ECON 1500, MHR 2990, FCHD 3350, ACCT 2010.

Department of Business Information Systems

Marketing Education Minor (28-32 credits)

This is a **teaching minor**. Students must be working on a teaching license and must also teach in at least one marketing education class as part of their student teaching experience.

BIS 1400 Microcomputer Applications in Business (F, Sp, Su) (3 cr) or Passing grade on Computer and Information Literacy competency exam (0 cr)	0-3
BIS 1420 Word Processing Applications (F,Sp)	3
ECON 1500 (BAI) Introduction to Economic Institutions, History, and Principles (F, Sp)	3
ACCT 2010 Survey of Accounting I (F, Sp, Su).....	3
BIS 2300 Business Data Communications and Networking (F, Sp, Su)	3
BIS 2400 Web Design for Business Applications (F, Sp, Su) (3 cr) or	
BIS 3550 Principles of Selling (online) (2 cr).....	2 or 3
BIS 3000 Principles of Business and Marketing Education (F, Sp).....	1
BIS 3300 Clinical Experience I (F,Sp) (1 cr) or	
BIS 4300 Clinical Experience II (F,Sp) (1 cr).....	1
BIS 3400 Methods of Teaching Keyboarding and Microcomputing (F or online).....	3
BA 3500 Fundamentals of Marketing (F, Sp, Su).....	3
BIS 4400 Business Education and Marketing Education Methods (Sp).....	3
BA 4510 Buyer Behavior (F,Sp) (3 cr) or	
BA 4550 Promotion Management (F,Sp) (3 cr).....	3

Business Computer and Information Systems Teaching Minor (29-32 credits)

This is a teaching minor. To obtain this minor, students must be working on a teaching license and must also teach in at least one business computer applications class as part of their student teaching experience. A minimum 2.50 GPA is required in minor classes.

BIS 1400 Microcomputer Applications in Business (F, Sp, Su) (3 cr) or Passing grade on Computer and Information Literacy competency exam (0 cr)	0-3
BIS 1420 Word Processing Applications (F,Sp)	3
BIS 2300 Business Data Communications and Networking (F, Sp, Su)	3
BIS 2400 Web Design for Business Applications (F, Sp, Su).....	3
BIS 2450 Spreadsheets and Databases for Business (F, Sp, Su)	3
BIS 3000 Principles of Business and Marketing Education (F, Sp).....	1
BIS 3100 Business Information Systems (F, Sp, Su).....	3
BIS 3300 Clinical Experience I (F,Sp) (1 cr) or	
BIS 4300 Clinical Experience II (F,Sp) (1 cr).....	1
BIS 3400 Methods of Teaching Keyboarding and Microcomputing (F or online).....	3
BIS 3450 Business Applications Using Visual Basic (F, Sp, Su) (3 cr) or	
BIS 3500 Management Information Systems Development (F, Sp, Su) (3 cr)	3
BIS 5300 Advanced Data Communications (F,Sp).....	3
BIS 5400 Local Area Network Management for Business (F, Sp).....	3

The minors listed above are teaching minors and are available only to those working toward a teaching license.

Business Information Systems Minor

A minimum 2.50 GPA is required in all courses counted toward the minor.

Business Majors (21-22 credits)

Students majoring in the College of Business must take 21-22 credits, as follows:

BIS 2300 Business Data Communications and Networking (F, Sp, Su)	3
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BIS 2450 Spreadsheets and Databases for Business (F, Sp, Su)	3
BIS 3100 Business Information Systems (F, Sp, Su)	3
BIS 3330 Database Management (F, Sp, Su)	3
BIS 3450 Business Applications Using Visual Basic (F, Sp, Su) (3 cr) or	
BIS 3500 Management Information Systems Development (F, Sp, Su) (3 cr)	3
CS 1700 Introduction to Computer Science—CS 1 (F, Sp, Su) (3 cr) or	
CS 3410 (CI/DSC) Algorithm Development: JAVA/Internet (F, Su) (3 cr)	3

Choose one of the following courses (3-4 credits):

ACCT 4500 Accounting Information Systems (F, Sp)	3
BIS 4330 Database Implementation (F,Sp).....	3
BIS 5100 Systems Design and Implementation (F,Sp) (3 cr) and	
BIS 5110 Systems Design Laboratory (F,Sp) (1 cr)	4
BIS 5150 Management Support Systems	3
BIS 5300 Advanced Data Communications (F,Sp).....	3
BIS 5400 Local Area Network Management for Business (F, Sp).....	3
BIS 5700 Internet Management and Electronic Commerce (F,Sp)	3
CS 1700⁹ Introduction to Computer Science—CS 1 (F, Sp, Su) (3 cr) or	
CS 3410 (CI/DSC)⁹ Algorithm Development: JAVA/Internet (F, Su) (3 cr) or	
CS 3510 (QI/DSC) Algorithm Development: COBOL/Business (F) (3 cr)	3

Nonbusiness Majors (27-31 credits)

Students whose majors are **not** in the College of Business must take the following courses **in addition** to those previously listed on this page:

ACCT 2010 Survey of Accounting I (F, Sp, Su).....	3
ACCT 2020 Survey of Accounting II (F, Sp, Su).....	3
BIS 1400¹⁰ Microcomputer Applications in Business (F, Sp, Su) (3 cr) or	
Passing grade on Computer and Information Literacy competency exam (0 cr).....	0-3

⁹CS 1700 or 3410 may be chosen as an elective, if not taken as a required course for the section above.

¹⁰Prerequisite: Ability to keyboard at a minimum of 25 wpm. Students may meet this prerequisite by passing a waiver exam or by completing a keyboarding or word processing class.

Electronic Commerce Minor

A minimum 2.50 GPA is required in all courses counted toward the minor.

Business Majors (19 credits)

Students majoring in the College of Business must take 19 credits, as follows:

BIS 2400 Web Design for Business Applications (F, Sp, Su).....	3
BIS 3330 Database Management (F, Sp, Su)	3
BIS 3450 Business Applications Using Visual Basic (F, Sp, Su) (3 cr) or	
BIS 3500 Management Information Systems Development (F, Sp, Su) (3 cr)	3
BIS 5100 Systems Design and Implementation (F,Sp)	3
BIS 5110 Systems Design Laboratory (F,Sp).....	1
BIS 5300 Advanced Data Communications (F,Sp).....	3
BIS 5700 Internet Management and Electronic Commerce (F,Sp)	3

Nonbusiness Majors (28 credits)

Students whose majors are **not** in the College of Business must take the following courses **in addition** to those listed above:

ACCT 2010 Survey of Accounting I (F, Sp, Su).....	3
BIS 2450 Spreadsheets and Databases for Business (F, Sp, Su)	3
BA 3500 Fundamentals of Marketing (F, Sp, Su).....	3

Department of Business Information Systems

College of Business majors who are minoring in Electronic Commerce should take MHR 4880, Business Strategy in an Entrepreneurial Context, as their capstone class in MHR.

Student Organizations

The Department of Business Information Systems sponsors or co-sponsors three student organizations. Each group provides unique experiences that can complement and enrich formal coursework. Leadership development and human relations skills are among the personal attributes enhanced by involvement in the various organization activities.

Association for Computing Machinery (ACM)

ACM, a professional society for the information systems industry, sponsors a student chapter at USU. The goals of ACM are to: (1) provide leadership experiences for undergraduate and graduate business information systems majors; (2) help student members plan their careers and find employment by introducing them to practicing systems professionals; and (3) foster a professional attitude among business information systems majors so that they will contribute to their field.

Delta Epsilon Chi (DEX)

Delta Epsilon Chi (DEX) is a cocurricular organization designed for marketing education and marketing majors. The major goal of DEX is to help students prepare for careers in marketing or marketing education. DEX provides students with opportunities to compete in marketing events at the state and national levels. Membership is open to all students interested in business and marketing.

Delta Pi Epsilon (DPE)

Delta Pi Epsilon (DPE) is a national honorary fraternity for graduate students. Purposes of the organization include enhancement of research, scholarship, service, and cooperation in the profession. Election to membership requires review by members and faculty of the Department of Business Information Systems.

Additional Information

For more information about requirements for the majors and minors within the Business Information Systems Department, see the major requirement sheets, available from the department, or online at: <http://www.usu.edu/ats/majorsheets/>

Graduate Programs

Master of Science

Students applying for admission to the Master of Science program in Business Information Systems must take the GMAT test. A score at the 40th percentile or better on the GMAT is required for admission. Undergraduate GPA should be 3.0 or above. Meeting minimum requirements does not guarantee admission.

The MS requires a minimum of 33 credits. A minimum of 24 credits of academic work must be in classes numbered 6000 and above. Twelve or more credits should be in the area of specialization. Students with bachelor's degrees outside of business may be required to complete additional coursework.

Students in the master's program pursue the *Plan C* option, where a research paper is completed in a special research class. Those who

wish to pursue the *Plan A* thesis option must have permission from their committee to do so.

All MS degrees in the BIS Department require the following core: BIS 6150, 6440, 6810.

The specialization in **Management Information Systems (MIS)** is for students who wish to work as systems analysts, application programmers, network managers, information managers, information center managers, and trainers in business information systems.

Students are expected to have a background in business information systems. Required courses are BIS 6120, 6200, 6330, 6400 (or 6700), in addition to the departmental core. Students who choose the Plan A option must complete 6 credits of BIS 6970. Students may take credits in Business Information Systems, Computer Science, Instructional Technology, Business Administration, Accounting, Economics, or other approved electives to complete the 9 credits of electives required.

The specializations in **Business Education, Marketing Education, and Training and Development** are designed for those who are teaching in an area of business or who wish to work in training and development in business and industry. Required courses for the Business Education or Marketing Education specialization are BIS 6350, 6450, 6700, 6720, 6730, and 6770. Students must complete 15 credits of electives chosen from the following list (or select others with committee approval): BIS 6350, 6400, 6600, 6720, 6730, 6770; BUS 6250.

Required courses for the Training and Development specialization are BIS 6350, 6450; and BUS 6250. Students must complete 15 credits of electives chosen from the following list (or select others with committee approval): BIS 6120, 6330, 6410.

For a current checklist of requirements, students should contact their departmental graduate advisor.

The USU MS in Business Information Systems is the only master's program in Business Information Systems in the state of Utah. Graduates are placed in the West and throughout the nation.

Master of Education

Students desiring admission to the MEd program must also meet the requirements of the Secondary Education Department.

The MEd degree in secondary education with specialization in business education has a master's project requirement as part of the program. The program is devised specifically for the practicing secondary school teacher of business or marketing education. Students complete a core area in secondary education, as well as requirements in business education and subject-matter-oriented courses. The program is also designed to prepare people to teach in public secondary schools.

Doctor of Philosophy and Doctor of Education

Applicants for admission to the College of Education and Human Services PhD or EdD programs with a specialization in Business Information Systems must take the GRE. Scores on the verbal and quantitative test must be at or above the 40th percentile. No minimum score is required on the analytical section (required by the Educational Testing Service).

Department of Business Information Systems

The Department of Business Information Systems cooperates with other departments in offering the interdepartmental Doctor of Philosophy (PhD) and Doctor of Education (EdD). Within the Business Information Systems specialization, emphases can be pursued in business education, marketing education, business information systems, and business communications. Other subject-matter emphases are also available. The PhD is a research-based degree. The EdD degree is a practitioner's degree. Both degrees require dissertations. Graduates secure positions teaching business subjects or business-teacher education in colleges and universities or in business and industry. Former graduates are currently in various positions in higher education, including higher education administration; in teacher education instruction; and in business and industry.

Additional Information

Specific details about each of the foregoing degree programs are outlined in policy and procedure documents available through the department. All requirements are subject to change; check with the department for current requirements.

The business and marketing teacher education programs, at the undergraduate and graduate levels, are ranked highly and respected throughout the nation, with faculty who are nationally and internationally recognized.

All students must meet admission requirements as specified by the School of Graduate Studies (see pages 93-94).

Research

Faculty in the Department of Business Information Systems are active in research and scholarly endeavors. Current and published research topics include business communications; international communications; improvement of instruction in teaching; business information systems as related to business and industry; curriculum for business schools; business reengineering; electronic commerce; group decision support systems; microcomputer applications; use of microcomputers in various subjects, including accounting and business communications; cooperative education; issues in higher education; and other areas related to business information systems, marketing education, and business education.

Financial Assistance and Assistantships

Funds for scholarships are provided through the School of Graduate Studies and administered in the department. Those interested in scholarships should contact the graduate director or the department head.

Each year several high-quality graduate teaching assistants are needed. These assistants generally teach classes in keyboarding, word processing, business communications, and microcomputer applications. Those who are interested in teaching assistantships must apply through the department head. They must have had teaching experience or be willing to take teaching methods classes, as well as the School of Graduate Studies-sponsored teaching assistant workshop, prior to receiving an assistantship.

Career Opportunities

Business Information Systems is one of the fastest growing fields in business and industry. Follow-up studies show that information systems positions pay excellent salaries, and the placement rate of students is almost 100 percent. Currently, there is also a great demand for business teachers in public education.

Business Information Systems Faculty

Professors

Karen A. Forcht, business information systems, business communication, data management, computer security
Dennis J. LaBonty, business information systems, business education
David H. Olsen, business information systems
James Calvert Scott, business education, business communications
John F. Vinsonhaler, business information systems

Professors Emeritus

H. Robert Stocker
William A. Stull

Associate Professors

Jeffrey J. Johnson, business information systems
Robert J. Mills, business information systems
David J. Paper, business information systems

Assistant Professors

Karina Hauser, lean manufacturing, artificial intelligence
Yong Seog Kim, data mining
Jean A. Pratt, business information systems
Zsolt Ugray, business information systems, electrical commerce and optimization

Principal Lecturers

Susan M. Jones, business information systems, business communications
Marianna Larsen, business information systems, business communications
Craig J. Peterson, business information systems
Dana H. Swensen, business information systems, business communications

Senior Lecturer

Ralph B. "Bernie" Lantz, computer technology, networks security, business information systems, computer literacy

Course Descriptions

Business Information Systems (BIS), pages 473-476

Department of Chemistry and Biochemistry

Department Head: Steve Scheiner

Location: Maeser Laboratory 140

Phone: (435) 797-1619

FAX: (435) 797-3390

E-mail: chemist@cc.usu.edu

WWW: <http://www.chem.usu.edu>

Undergraduate Advisors:

Faculty advisors in the Department of Chemistry and Biochemistry are as follows:

Ann E. Aust, Widtsoe 233, (435) 797-1629, aaust@cc.usu.edu

Stephen E. Bialkowski, Maeser Lab 359, (435) 797-1907, stephen.bialkowski@usu.edu

Scott A. Ensign, Widtsoe 239, (435) 797-3969, ensigns@cc.usu.edu

Rick C. Holz, Widtsoe 237, (435) 797-2609, rholz@cc.usu.edu

Steve Scheiner, Maeser Lab 140, (435) 797-7419, scheiner@cc.usu.edu

Vernon D. Parker, Widtsoe 345, (435) 797-1697, vparker@cc.usu.edu

For faculty advisor assignment, contact Department of Chemistry and Biochemistry at (435) 797-1619 or chemist@cc.usu.edu.

Degrees Offered: Bachelor of Science (BS), Bachelor of Arts (BA), Master of Science (MS), Doctor of Philosophy (PhD) in Chemistry; MS and PhD in Biochemistry; BS and BA in Chemistry Teaching; BS and BA in Composite Teaching— Physical Science (Chem)

Undergraduate emphases: BS—Professional Chemistry, Biochemistry, Environmental Chemistry, Chemical Education, Life Science

Graduate specializations: *Chemistry*—Analytical Chemistry, Inorganic Chemistry, Organic Chemistry, Physical Chemistry

Undergraduate Programs

Objectives

Chemistry is a subject that addresses the properties of materials and the transformations that they undergo. Especially important are aspects of energy and structure related to chemical reactivity. Consequently, students of many disciplines take courses in chemistry to learn about the behavior of the substances they will use or reference. The Department of Chemistry and Biochemistry offers a wide variety of courses for those whose majors and/or anticipated careers require a knowledge of chemistry. These areas of study include nutrition, engineering, biology, agriculture, natural resources, medicine, law, and education, to name a few. Many students also choose chemistry as an elective course to better prepare themselves as citizens in a technological world.

The **Bachelor of Science Degree** entails considerable specialization in chemistry and related areas. The BS emphases require a common core of courses, but allow for a different concentration of advanced work according to the interests and career objectives of the student. The **BS with Professional Chemistry Emphasis**, **BS with Environmental Chemistry Emphasis**, and **BS with Biochemistry**

Emphasis degrees meet the requirements for certification by the American Chemical Society (ACS). The certified degree emphases provide excellent preparation for immediate entry into the job market or for graduate school in chemistry, biochemistry, chemical engineering, molecular biology, nutrition, food science, materials science, and a wide variety of other fields. ACS certification in **Chemical Education** is available to students who complete an ACS-certified program, together with the Professional Education program in secondary education. The **BS with Life Science Emphasis** degree is popular for students wishing to go on to medical or dental graduate programs. The life science emphasis is particularly appropriate for **premedical** and **predental** students who want a strong base for understanding the nature of chemical reactions in the body and the behavior of the drugs they will prescribe, or who want an attractive alternative should they decide ultimately not to pursue medical or dental school. The **Chemistry Teaching Major** or the **Composite Teaching Major in Physical Science** are available to those who want a career in secondary education. The BA degree is an excellent choice for students with an interest in studying **law** or **business** and who have an interest in science.

The core of the program utilizes year-long sequences of classes. The first-year sequence introduces the basic principles of chemistry, as well as most of the major concepts of the science. The second year explores in greater depth the characteristics of carbon-based compounds that serve as the backbone for the chemistry of life; for most drugs and medicines; for petroleum; for most fibers, paints, and plastics; and for many other commercial products. The third year examines in greater depth the models, theories, and mathematical interpretation of the structures, rates of change, energetics, and other properties of chemicals. In addition, one-semester courses examining the chemistry of life processes, the behavior of inorganic substances, and the analysis of the composition of substances are required. Many of the sequences have associated laboratory courses where students get hands-on practice. Here they synthesize compounds, measure physical properties, analyze samples, and determine structural features of compounds, using modern techniques and instrumentation. The requirements of the BS and BA degrees in chemistry, along with University and University Studies requirements, are summarized here. The specific requirements for the teaching major and for the composite teaching major in physical science are also included.

Students are also urged to study these requirements and to visit with their advisor on a regular basis about progress toward the completion of their degrees or for any questions regarding complementary courses and career goals.

Assessment

The Department of Chemistry and Biochemistry has implemented a multilayered assessment strategy that defines learning objectives at the following levels: individual courses, divisional levels, and at the overall program level for the chemistry major. Details of this strategy can be found at: <http://www.chem.usu.edu/assessment/index.php>

Learning objectives for the Chemistry Major are specifically outlined in an organized matrix at: <http://www.chem.usu.edu/assessment/matrix.pdf>

General Requirements

Admission Requirements

First-year students admitted to USU in good standing qualify for admission to this major. Transfer students from other institutions

Department of Chemistry and Biochemistry

need a 2.2 transfer GPA, and students transferring from other USU programs need a 2.0 total GPA for admission to this major in good standing.

Students interested in studying chemistry should take high school mathematics courses that will enable them to start calculus during their first semester at USU. High school coursework in chemistry and physics is also desirable. AP credit in chemistry may be counted toward the degree. For details, contact the departmental advising faculty.

No CHEM prefix course may be applied toward graduation with any major or minor in chemistry with an earned grade of less than C-. Except for CHEM 4800 and 4990, no CHEM prefix course may be taken on a *Pass/Fail* basis. No CHEM prefix course may be repeated more than one time to improve the grade to a C- or better. A student dropped from the chemistry program for failure to meet this standard may appeal to the departmental Curriculum Committee for readmission.

Chemistry Core Curriculum

In addition to the University Studies requirements for graduation, chemistry majors take a series of core courses spread across a traditional four-year period. The completion of the chemistry core also covers the College of Science requirements for graduation.

Chemistry Major Core Requirements

Suggested Schedule

First Year (30-32 credits)

Fall Semester (15-16 credits)

CHEM 1210 Principles of Chemistry I	4
CHEM 1230 Chemical Principles Laboratory I	1
MATH 1210 (QL) Calculus I	4
University Studies Courses	6-7

Spring Semester (15-16 credits)

CHEM 1220 (BPS) Principles of Chemistry II	4
CHEM 1240 Chemical Principles Laboratory II	1
MATH 1220 (QL) Calculus II	4
University Studies Courses	6-7

Second Year (32-33 credits)

Fall Semester (16 credits)

CHEM 2310 ² Organic Chemistry I	4
CHEM 2330 Organic Chemistry Laboratory I	1
CHEM 3600 (QI) Quantitative Analysis	3
CHEM 3610 Quantitative Analysis Laboratory	1
PHYX 2210 (QI) General Physics–Science and Engineering I	4
MATH 2210 (QI) Multivariable Calculus	3

Spring Semester (16-17 credits)

CHEM 2320 ³ Organic Chemistry II	4
CHEM 2340 Organic Chemistry Laboratory II	1
CHEM 3510 Intermediate Inorganic Chemistry	2
CHEM 3520 Inorganic Chemistry Laboratory	1
PHYX 2220 (QI/BPS) General Physics–Science and Engineering II	4
University Studies Courses	4-5

Third Year (29-31 credits)

Fall Semester (14-16 credits)

CHEM 3060 (QI) ² Physical Chemistry	3
CHEM 3080 (CI) ² Physical Chemistry Laboratory I	1
CHEM 5700 ² General Biochemistry I	3
MATH 2250 (QI) ¹ Linear Algebra and Differential Equations (4 cr) or	

STAT 3000 (QI) ¹ Statistics for Scientists (3 cr)	3 or 4
University Studies or elective courses	4-5

Spring Semester (15 credits)

CHEM 3070 (QI) ³ Physical Chemistry	3
CHEM 3090 (CI) ³ Physical Chemistry (Laboratory II)	1
CHEM 5640 ³ Instrumental Analysis	3
CHEM 5650 ³ Instrumental Analysis Laboratory	2
University Studies or elective courses for specific degree emphasis	6

Fourth Year (31-32 credits)

CHEM 4990 (CI) Undergraduate Seminar	2
Upper-division and advanced elective courses for specific degree emphasis	29-30

¹ The completion of MATH 2250 or STAT 3000 is optional for the Teaching Major.

Chemistry Degree Emphases

Professional Chemistry Emphasis (ACS Certified)

In addition to the chemistry core, students must complete the following:

CHEM 5520 ² Advanced Inorganic Chemistry (F)	2
CHEM 5530 ³ Advanced Synthesis Laboratory (Sp)	2
Advanced electives as approved by department	6

Biochemistry Emphasis (ACS Certified)

In addition to the chemistry core, students must complete the following:

CHEM 5710 ³ General Biochemistry II (Sp)	3
CHEM 5720 ³ General Biochemistry Laboratory (Sp)	2
BIOL 1210 ² Biology I (F)	4
Advanced Biology electives, as approved by department	4

Environmental Chemistry Emphasis (ACS Certified)

In addition to the chemistry core, students must complete the following:

CHEM 5670 ³ Intermediate Environmental Chemistry (Sp)	3
CHEM 5680 ³ Environmental Chemistry Laboratory (Sp)	2
Introductory environmental electives as approved by department	6-7
Advanced environmental electives as approved by department	3

Chemical Education Emphasis (ACS Certified)

Note: Beginning in 2006, all USU teacher education candidates will be required to take and pass the content exam approved by the Utah State Office of Education in their major content area prior to student teaching.

In addition to the chemistry core, students must complete the following:

Required courses for the Secondary Teacher Education Program (STEP)	35
Teaching minor from outside the Department of Chemistry and Biochemistry	12-16

² Offered fall semester only

³ Offered spring semester only

BS Degree with Honors

This option can be met by completing any ACS certified program and by meeting the following requirements:

1. Minimum GPA of 3.50 in chemistry courses
2. Overall GPA of 3.30

Department of Chemistry and Biochemistry

3. Completion of 15 credits of honors work as follows:

CHEM 4800H (CI) Research Problems (F, Sp, Su).....	3-6
CHEM 4990H (CI) Undergraduate Seminar (F, Sp)	2
Credits selected from Honors courses numbered 3000 or above in chemistry or related subjects, as appropriate. Three credits may be selected from chemistry courses numbered 6000 or above.....	
	3-6

In addition, select two courses from the following:

CHEM 2320H Organic Chemistry II (Sp).....	4
CHEM 3070H (QI) Physical Chemistry (Sp).....	3
CHEM 5640H Instrumental Analysis (Sp)	3
CHEM 5700H General Biochemistry I (F)	3

BS in Chemistry, Life Science Emphasis

In addition to the Chemistry Core Requirements (with the exception of CHEM 5640, 5650), students must complete the following:

BIOL 1210 Biology I (F).....	4
BIOL 1220 (BLS) Biology II (Sp) (4 cr) or	
BIOL 2000 Human Physiology (F,Sp,Su) (4 cr).....	4
BIOL 3200 (QI) Principles of Genetics (F,Sp,Su) (4 cr) or	
BIOL 3300 (BLS) General Microbiology (F,Sp) (4 cr)	4
CHEM 5710 General Biochemistry II (Sp).....	3
CHEM 5720 General Biochemistry Laboratory (Sp)	2

BA in Chemistry

In addition to the chemistry core (with the exception of CHEM 5640, 5650), students must complete the following:

CHEM 5520 Advanced Inorganic Chemistry (F) (2 cr) or	
CHEM 5640 Instrumental Analysis (Sp) (3 cr).....	2 or 3
Completion of one foreign language (16 cr) or	
Completion of two foreign languages (20 cr).....	
	16 or 20

Chemistry Teaching Major

In addition to the Chemistry Core Requirements (with the exception of MATH 2250 or STAT 3000, and CHEM 5640 and 5650), students must complete the following:

SCI 4300 Science in Society (F,Sp)	2
Required courses for the Secondary Teacher Education Program (STEP).....	
	35
Teaching minor from outside the Department of Chemistry and Biochemistry	
	12-16

An overall 2.75 GPA in a minimum of 60 semester credits of approved University coursework is required for admission into the Secondary Teacher Education Program (STEP). A minimum overall GPA of 2.75 is required for graduation. Specific for admission to this program, a student must have at least a 2.75 GPA in CHEM 1210, 1220, 1230, and 1240.

Composite Teaching Major in the Physical Sciences

This degree is available through the Chemistry and Biochemistry or Physics departments. Students with a Composite Teaching Major in Physical Sciences should plan their programs carefully in order to meet the upper-division requirement for graduation. An overall 2.75 GPA in a minimum of 60 semester credits of approved University coursework is required for admission into the Secondary Teacher Education Program (STEP). A minimum overall GPA of 2.75 is required for graduation. Students who may wish to teach Integrated Science at the middle or junior high school level should talk to their advisor about completing the courses necessary for an Integrated Science endorsement.

Note: Beginning in 2006, all USU teacher education candidates will be required to take and pass the content exam approved by the Utah State Office of Education in their major content area prior to student teaching.

Specific for admission to this program, a student must have at least a 2.75 GPA in the following chemistry and physics courses:

CHEM 1210 Principles of Chemistry I (F,Sp)	4
CHEM 1220 (BPS) Principles of Chemistry II (F,Sp,Su)	4
CHEM 1230 Chemical Principles Laboratory I (F,Sp)	1
CHEM 1240 Chemical Principles Laboratory II (F,Sp)	1

PHYX 2110 The Physics of Living Systems I (4 cr) **and**
PHYX 2120 (BPS) The Physics of Living Systems II (4 cr).....

OR
PHYX 2210 (QI) General Physics–Science and Engineering I
(4 cr) **and**
PHYX 2220 (QI/BPS) General Physics–Science and Engineering II
(4 cr)

(PHYX 2210 and 2220 are preferred.)
This program does not include many aspects of the Chemistry Core.

Required Courses:

CHEM 1210 Principles of Chemistry I (F,Sp)	4
CHEM 1220 (BPS) Principles of Chemistry II (F,Sp,Su)	4
CHEM 1230 Chemical Principles Laboratory I (F,Sp)	1
CHEM 1240 Chemical Principles Laboratory II (F,Sp)	1
CHEM 2300 Principles of Organic Chemistry (F) (3 cr) or	
CHEM 2310 Organic Chemistry I (F) (4 cr)	3 or 4
CHEM 2330 Organic Chemistry Laboratory I (F)	1
PHYX 1000 (BPS) Introductory Astronomy	3
PHYX 1030 (BPS)⁴ Intelligent Life in the Universe (3 cr) or	
PHYX 3030 (DSC/QI) The Universe (3 cr)	3

PHYX 2110 The Physics of Living Systems I (4 cr) **and**
PHYX 2120 (BPS) The Physics of Living Systems II (4 cr).....

OR
PHYX 2210 (QI) General Physics–Science and Engineering I
(4 cr) **and**
PHYX 2220 (QI /BPS) General Physics–Science and Engineering II
(4 cr)

MATH 1210 (QL) Calculus I (F,Sp,Su)	4
MATH 1220 (QL) Calculus II (F,Sp,Su)	4
STAT 3000 (QI) Statistics for Scientists (F,Sp).....	3
SCI 4300 Science in Society (F,Sp)	2
BIOL 1010 (BLS) Biology and the Citizen (F,Sp,Su).....	3
GEOL 1150 (BPS) The Dynamic Earth: Physical Geology (F,Sp).....	4
BMET 2000 (BPS) The Atmosphere and Weather (F,Sp).....	4
Teacher licensure courses from Secondary Education (35 cr).....	
	35
A teaching minor is optional for the Composite Teaching Major in the Physical Sciences.	

⁴PHYX 1030 is sometimes listed as USU 1360, ST: Intelligent Life in the Universe.

Chemistry Minor

In addition to CHEM 1210, 1220, 1230, and 1240, 10 additional credits in Chemistry prefix courses at the 2000 level or higher, as approved by department, are required (either CHEM 2300 or 2310 may be included).

Chemistry Teaching Minor

In addition to CHEM 1210, 1220, 1230, 1240, CHEM 2300 or 2310, and CHEM 2330, 3-4 additional credits selected from the following are required:

Department of Chemistry and Biochemistry

CHEM 2320 Organic Chemistry II (Sp) (if CHEM 2310 has been previously selected)	4
CHEM 3060 (QI) Physical Chemistry (F).....	3
CHEM 3510 Intermediate Inorganic Chemistry (Sp) (2 cr) and	
CHEM 3520 Inorganic Chemistry Laboratory (Sp) (1 cr)	3
CHEM 3600 (QI) Quantitative Analysis (F).....	3
CHEM 3650 (DSC) Environmental Chemistry (Sp) (3 cr) or	
CHEM 3700 Introductory Biochemistry (Sp) (3 cr).....	3

Undergraduate Research Opportunities

The Chemistry and Biochemistry Department encourages students in all departmental majors to engage in undergraduate research. For information about how they can become involved in undergraduate research, students should contact Joan Hevel, the departmental undergraduate research coordinator, (435) 797-1622, jhevel@cc.usu.edu.

Career Opportunities

Chemistry degree holders work in a wide variety of professions, from physicians, lawyers, and professors to research/development, sales, or production in the chemical, oil, pharmaceutical, metals, electronic, and biochemical industries. Government at all levels employs chemists, including the federal Departments of Defense, Health and Human Services, Agriculture, and Interior. A graduate with a bachelor's degree often begins work in chemical analysis or sales or may assist senior chemists in research and development. A graduate with a teaching major or chemistry education emphasis may teach in public schools. A graduate degree is usually needed to direct research or teach at the university level. Degree holders from the Department of Chemistry and Biochemistry have had excellent success in obtaining support for graduate studies, often at very prestigious institutions, and in obtaining employment directly following graduation. For further information, students should contact their advisor.

Departmental Honors

Students who would like to experience greater academic depth within their major are encouraged to enroll in departmental honors. Through original, independent work, Honors students enjoy the benefits of close supervision and mentoring, as they work one-on-one with faculty in select upper-division departmental courses. Honors students also complete a senior project, which provides another opportunity to collaborate with faculty on a problem that is significant, both personally and in the student's discipline. Participating in departmental honors enhances students' chances for obtaining fellowships and admission to graduate school. Minimum GPA requirements for participation in departmental honors vary by department, but usually fall within the range of 3.30-3.50. Students may enter the Honors Program at almost any stage in their academic career, including at the junior (and sometimes senior) level. The campus-wide Honors Program, which is open to all qualified students regardless of major, offers a rich array of cultural and social activities, special classes, and the benefit of Honors early registration. Interested students should contact the Honors Program, Merrill Library 374, (435) 797-2715, honors@cc.usu.edu. Additional information can be found online at: <http://www.usu.edu/honors/>

Additional Information

For more information about requirements for the majors and minors within the Chemistry and Biochemistry Department, see the Chemistry Major Requirement Sheet, available from the department, or online at: <http://www.usu.edu/ats/majorsheets/>

Graduate Programs

Admissions Requirements

See the general admission requirements for the School of Graduate Studies (pages 93-94). All applicants should have a bachelor's degree or master's degree in chemistry or biochemistry from an accredited institution. Appropriate undergraduate preparation is expected; applicants not fully prepared may be admitted with the condition that appropriate undergraduate courses are taken as necessary.

Applications are especially encouraged during the spring semester for expected admission in the following fall semester. However, the Graduate Recruiting and Admissions Committee screens applications throughout the year. Detailed information about the graduate programs and faculty research activities can be found on the Internet at: <http://www.chem.usu.edu>

Degree Programs

Master of Science

To earn an MS in chemistry or biochemistry, a student must meet the general requirements of the School of Graduate Studies (see pages 97-99), conduct research under the direction of a major professor and write a thesis acceptable to a supervisory committee (Plan A) or write a review-of-literature paper (Plan B), and pass an oral examination that is principally a defense of the thesis or the Plan B paper.

Qualified undergraduate chemistry majors at USU may apply in the third year for admission to the MS program. Students may be admitted to this MS program if they have a *B* average in chemistry, physics, and mathematics courses, and have completed the one-year sequences in general, organic, and physical chemistry (including labs), two courses in analytical or inorganic chemistry, two semesters of physics, math through MATH 2210, and at least 15 credits of their University Studies requirements.

Students should consult with the chairperson of the Graduate Recruiting and Admissions Committee to be certain of their eligibility for this program. The chairperson will then submit an application to the department head and to the School of Graduate Studies for approval. Students must earn a satisfactory score on the GRE exam before the completion of the MS degree. All requirements for the BS degree must be completed within two semesters of admission. The MS coursework cannot include coursework counted toward the BS degree.

Doctor of Philosophy

To earn the PhD in chemistry or biochemistry, a student must successfully complete a core curriculum of courses and other courses as approved by a supervisory committee. In addition, preliminary examinations (both oral and written) must be passed and research in a field of specialization must be conducted. The final requirement is the writing and defense of a dissertation before the student's supervisory committee.

Department of Chemistry and Biochemistry

Biochemistry Course Requirements

Every MS and PhD student in the biochemistry program must complete at least four of the graduate biochemistry core courses (CHEM 6700, 6710, 6730, 6740, 6750, and 6760). In addition, all students must register for at least 2 credits of CHEM 6720 in the first semester of residence to participate in research training. Both MS and PhD students must complete a total of at least 15 credits in coursework, exclusive of seminar and research credit. The Program of Study is approved by the student's supervisory committee. A total of 30 credits is required for the MS degree, and a total of 90 credits is required for the PhD. Beginning students who already hold an MS degree need 60 credits to complete the PhD program.

Chemistry Course Requirements

Every MS and PhD student in the chemistry program must complete the courses required for their specialization: *Analytical*—CHEM 7600, 7610; *Inorganic*—CHEM 6500, 6510; *Organic*—CHEM 6300, 7300, 7310; or *Physical Chemistry*—CHEM 6010, 6020, 7020. Both MS and PhD students must complete a total of at least 15 credits in coursework, exclusive of seminar and research credit. The Program of Study is approved by the student's supervisory committee. A total of 30 credits is required for the MS degree and a total of 90 credits is required for the PhD. Beginning students who already hold an MS degree need 60 credits to complete the PhD program.

Financial Assistance

The department offers financial support to students in the form of teaching assistantships, research assistantships, and fellowships. All applications for admission to the School of Graduate Studies constitute an application for financial assistance; it is not necessary to file a separate request. Teaching assistantships are the principal means of support for first-year students. Inquiries about current support levels should be directed to the department main office. The department is responsible for the first nine months of stipend and tuition, with the remaining summer stipend and tuition usually being paid from faculty research funds. Teaching assistants devote no more than 12 contact hours per week directing undergraduate laboratories, leading recitation sections, and assisting students with questions during the regular fall and spring semesters. Research assistantships, funded from individual faculty research grants, support students conducting research related to the grant projects. Although first-year students are not normally supported as research assistants, well-prepared students may be eligible for research support at the discretion of their major professor.

Fellowships are awarded by the University to outstanding students solely on the basis of merit. The department encourages students with strong academic records to apply for the University fellowships and national awards, and will provide assistance in obtaining and submitting the appropriate forms. Additionally, several graduate awards are given each year to honor exemplary performance in research and teaching.

The College of Science recently established the Willard L. Eccles Foundation Science Fellowship. The \$18,000 per year, three-year stipend is competitively awarded to highly qualified science applicants. Students applying to the graduate program will be considered for this fellowship, and will be sent the necessary information. Application deadline for this fellowship is March 1.

Chemistry and Biochemistry Faculty

Trustee Professor

Ann E. Aust, biochemistry

Professors

Steven D. Aust, biochemistry
Stephen E. Bialkowski, analytical chemistry
Scott A. Ensign, biochemistry
David Farrelly, physical chemistry
Alvan C. Hengge, organic chemistry
Richard C. Holz, bioinorganic chemistry
Vernon D. Parker, physical organic chemistry
Steve Scheiner, computational chemistry
Lance C. Seefeldt, biochemistry

Professors Emeritus

William M. Moore, physical chemistry
Richard K. Olsen, organic chemistry
Grant G. Smith, organic chemistry
Jack T. Spence, inorganic chemistry

Associate Professors

Lisa M. Berreau, inorganic chemistry
Alexander I. Boldyrev, physical chemistry
Robert S. Brown, analytical chemistry
Bradley S. Davidson, organic chemistry
John L. Hubbard, inorganic chemistry

Assistant Professors

Cheng-Wei Tom Chang, organic chemistry
Joan M. Hevel, biochemistry
Philip J. Silva, analytical chemistry

Research Assistant Professor

Tapas Kar, physical chemistry

Lecturer

Douglas G. Harris

Course Descriptions

Chemistry and Biochemistry (CHEM), pages 476-478

Department of Civil and Environmental Engineering

Department Head: Loren R. Anderson
Location: Engineering Laboratory 211
Phone: (435) 797-2932
FAX: (435) 797-1185
E-mail: beckyjh@cc.usu.edu
WWW: <http://www.engineering.usu.edu/cee>

Undergraduate Advisors:

Civil Engineering:

Engineering Advising Center, Engineering 314A, (435) 797-2705
kathy@engineering.usu.edu
ronnie@engineering.usu.edu
sophie@engineering.usu.edu

Environmental Engineering:

Engineering Advising Center, Engineering 314A, (435) 797-2705
kathy@engineering.usu.edu
ronnie@engineering.usu.edu
sophie@engineering.usu.edu

Undergraduate Division Heads:

Civil Engineering:

William J. Rahmeyer, Engineering 222 or Utah Water Research Laboratory 207, (435) 797-3180, rahmeyer@cc.usu.edu

Environmental Engineering:

R. Ryan Dupont, Utah Water Research Laboratory 319, (435) 797-3227, rdupo@cc.usu.edu

Graduate Program Division Heads:

Environmental Engineering:

R. Ryan Dupont, Engineering 216, (435) 797-3227, rdupo@cc.usu.edu

Geotechnical Engineering:

Joseph A. Caliendo, Engineering Laboratory 211, (435) 797-2896, joe@cc.usu.edu

Structural Engineering:

Marvin W. Halling, Engineering Laboratory 264, (435) 797-3179, halling@cc.usu.edu

Water Engineering:

Jagath J. Kaluarachchi, Utah Water Research Laboratory 248, (435) 797-3918, jkalu@cc.usu.edu

Transportation Systems Engineering:

Anthony Chen, Engineering 231, (435) 797-7109, achen@cc.usu.edu

Degrees offered: Bachelor of Science (BS) in Civil Engineering; BS in Environmental Engineering; Master of Engineering (ME), Master of Science (MS), Civil Engineer (CE) and Doctor of Philosophy (PhD) in Civil and Environmental Engineering

Graduate specializations: Environmental Engineering, Fluid Mechanics and Hydraulic Engineering, Geotechnical Engineering, Hazardous Waste Management, Structural Engineering and Mechanics, Transportation Engineering, Water Engineering, Water Resources Engineering and Hydrology

Undergraduate Programs

Objectives

Civil and Environmental Engineering is concerned with planning, designing, constructing, and operating various physical works; developing and utilizing natural resources in an environmentally sound manner; providing the infrastructure which supports the highest quality of life in the history of the world; and protecting public health and renovating impacted terrestrial and aquatic systems from the mismanagement of toxic and hazardous wastes. The Department of Civil and Environmental Engineering offers Bachelor of Science degrees in Civil Engineering and in Environmental Engineering. Both degrees are accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (EAC/ABET).

The objectives of the undergraduate programs in Civil Engineering and Environmental Engineering are to graduate engineers who have a solid educational foundation with broad experiences in engineering, the sciences, and the humanities; and who are prepared to enter graduate school, other professional training, or the workplace as effective professionals. These graduates will understand the significance of life-long learning and the importance of ethical conduct and will be qualified to assume roles of leadership in business, community, government, and the engineering profession and contribute significantly to global society as a whole.

Outcomes

Graduates with a BS degree in Civil Engineering from Utah State University will have:

1. Proven themselves proficient in mathematics; the sciences; and the structures, geotechnical, hydraulics, and transportation areas of civil engineering.
2. Demonstrated the ability to solve engineering problems, utilizing fundamental engineering principles, as well as the latest technologies and engineering tools, in the process of engineering analysis and design. They will have done this as individuals and as members of multidisciplinary teams.
3. Shown a capacity for investigation and experimentation into physical (engineering) phenomena, along with the ability to analyze and interpret engineering data in at least two of the following areas of civil engineering: structures, geotechnical, hydraulics, and transportation.
4. Demonstrated the capability to communicate verbally, in writing, and through the use of engineering communication media. They will also have shown the capacity to present the outcomes of their problem solving and design projects for groups of engineers and lay persons.
5. Exhibited an understanding of the role civil engineering plays in our modern global society, that much is to be learned from the past and applied to the present, and that a responsible engineer is ethical and will continue to increase his or her knowledge throughout his or her lifetime.

Department of Civil and Environmental Engineering

Graduates with a BS degree in Environmental Engineering from Utah State University will have:

1. Knowledge of basic science and engineering principles fundamental to the practice of environmental engineering including: mathematics, biology, chemistry, soil science, physics, fluid and solid mechanics, hydrology, and engineering economics.
2. Knowledge of environmental engineering practice in the areas of water supply and treatment; environmental systems dynamics; environmental chemistry and analysis; wastewater, air quality and solid and hazardous waste management; and public health and industrial hygiene.
3. Advanced knowledge of science and engineering principles in two of the following program emphasis areas: water, solids, natural systems, air quality, and public health.
4. Integration of advanced science and engineering principles in a multidisciplinary team environment for the solution of a comprehensive design problem in one of the program emphasis areas incorporating: applicable design standards; state-of-the-practice design tools; real-life economic, social, regulatory, political, ethical, and business design constraints; and applicable considerations for contemporary issues, such as product manufacturability, process sustainability, health and safety concerns, and system constructability.
5. Experience in written and oral communication using state-of-the-practice presentation methods throughout the course of their Professional Program in Environmental Engineering which include: laboratory reports and presentations, research paper presentations, design proposal and progress reports and presentations, and final design project presentations to both technical and lay audiences.
6. Experience in one of the environmental engineering practice areas in the design and conduct of experiments; collection, analysis, and interpretation of data; and modeling and representation of experimental results and presentation of experimental findings.

Assessment

The Civil and Environmental Engineering Department employs several methods to assess the quality of the two BS programs offered by the department. Assessments are made prior to graduation by measuring the performance of students in each class. In addition, the results of the FE exam, senior exit interviews, and faculty reviews of student portfolios are used. Postgraduate assessment of Civil and Environmental Engineering graduates is also conducted up to six years after graduation. Assistance from outside reviewers is also obtained in making the assessment. For more details, see the CEE assessment website at: <http://www.engineering.usu.edu/cee/assessment/>

Requirements

Admission Requirements

Admission requirements for the Department of Civil and Environmental Engineering are the same as those described for the University on pages 16-19. Students in good standing may apply for admission to the department. In addition, students must maintain the academic requirements outlined for the College of Engineering on pages 111-113.

Bachelor of Science Degrees

The Department of Civil and Environmental Engineering offers two Bachelor of Science degrees: one in Civil Engineering and one in Environmental Engineering. The four-year programs leading to these two degrees are listed below. During the first two years, students are in a pre-engineering program. Students must successfully complete the pre-engineering program or, in the case of transfer students, substantially equivalent coursework at another institution before they are accepted into the professional program. Transfer students may apply for permission to take upper-division courses in cases where postponement of these courses will prolong the student's time to graduate.

Design is a cornerstone of engineering that requires creative thinking, technical knowledge, the ability to organize and solve complex problems, and teamwork. Engineering design activities begin during the first two years and progress in-depth as each student's proficiency increases. These design activities culminate in a major senior design course, which integrates past engineering coursework into a focused, realistic design project. An important feature of the senior design experience is that students work in teams to complete the project.

The student who is majoring in or planning to major in Civil Engineering or Environmental Engineering needs to be aware of the College of Engineering requirements concerning admission to the college, pre-engineering program, admission to professional engineering programs, University Studies, and other academic requirements. Additional information concerning these items is given in the College of Engineering write-up on pages 111-113. It is the responsibility of the student to be aware of these rules and regulations. **Passing the Fundamentals of Engineering Exam is required for graduation.**

The Civil and Environmental Engineering Department strongly recommends that students have a high-end calculator, such as an HP calculator, that has the capabilities to do units, matrices, and programs in BASIC. Although not a requirement at this time, CEE students are strongly encouraged to have a modern desktop or laptop personal computer. Since computer technology is changing rapidly, students should seek advice from a knowledgeable professional on hardware and software requirements before purchasing a computer.

Students in the Civil Engineering program must establish proficiency in at least four areas of Civil Engineering. Proficiency is established through a combination of material covered in required courses, as well as by establishing depth through the selection of technical electives. Proficiency must be established in four of the following areas: Environmental Engineering, Fluid Mechanics/ Hydraulics, Geotechnical, Structures, Transportation, or Water Resources. The courses must be selected from the approved Technical Elective courses.

Undergraduate Course Requirements for Civil Engineering¹

Pre-engineering Program: Freshman and Sophomore

Freshman Year (29-31 credits)

Fall Semester (16 credits)

MATH 1210 (QL) ² Calculus I	4
CHEM 1210 ² Principles of Chemistry I	4
CHEM 1230 ² Chemical Principles Laboratory I	1
CEE 1880 ² Civil and Environmental Engineering Orientation and Computer Applications	1
CEE 2240 ² Engineering Surveying	3
University Studies Breadth Course	3

Department of Civil and Environmental Engineering

Spring Semester (13-15 credits)

MATH 1220 (QL) ² Calculus II.....	4
GEOL 1150 (BPS) ² The Dynamic Earth: Physical Geology.....	4
ETE 2270 ² Computer Engineering Drafting.....	2
BIOL 1010 (BLS) Biology and the Citizen.....	3
PHYX 2200 Elements of Mechanics (prereq. to PHYX 2220).....	2

Sophomore Year (32 credits)

Fall Semester (16 credits)

PHYX 2220 (BPS/QI) ² General Physics—Science and Engineering II (prereq. AP Physics or PHYX 2200).....	4
MATH 2250 (QI) ² Linear Algebra and Differential Equations.....	4
ENGR 2000 ² Engineering Mechanics Statics.....	2
ENGR 2200 ² Engineering Numerical Methods I.....	3
University Studies Breadth Course.....	3

Spring Semester (16 credits)

ENGL 2010 (CL) ² Intermediate Writing: Research Writing in a Persuasive Mode.....	3
ENGR 2020 ² Engineering Mechanics Dynamics.....	3
ENGR 2040 ² Strength of Materials.....	2
ENGR 2210 ² Engineering Numerical Methods II.....	2
CEE 2870 ² Sophomore Seminar.....	1
CEE 3030 Uncertainty in Engineering Analysis.....	2
University Studies Breadth Course.....	3

¹Passing the Fundamentals of Engineering Exam is required for graduation. The exam is offered in October and April. Application must be made 120 days in advance. The exam is usually taken during fall semester of the senior year.

²These courses are required for admission to the Professional Engineering Program (PEP).

Professional Engineering Program: Junior and Senior

Junior Year (31-33 credits)

Fall Semester (16 credits)

CEE 3010 Mechanics of Materials.....	2
CEE 3500 Civil and Environmental Engineering Fluid Mechanics.....	3
CEE 3610 ³ Environmental Management.....	3
CEE 3870 ³ Professional/Technical Writing in Civil and Environmental Engineering.....	2
University Studies Breadth Course.....	3
University Studies Depth Course (DSS).....	3

Spring Semester (15-17 credits)

CEE 3020 Structural Analysis.....	2
CEE 3510 Civil and Environmental Engineering Hydraulics.....	3
CEE 3880 Civil Engineering Design I.....	1
CEE Group A Courses ⁴	9-11

³CEE 3610 and 3870 must be taken concurrently.

Senior Year (29-32 credits)

Fall Semester (15-16 credits)

CEE 4200 Engineering Economics.....	2
CEE 4870 (CI) Civil Engineering Design II.....	2
CEE Senior Design Elective ⁵	3
CEE Technical Elective Courses ⁵	6
University Studies Depth Course (DHA).....	2-3

Spring Semester (14-16 credits)

CEE 4880 (CI) Civil Engineering Design III.....	2
CEE Group A Courses ⁴	6-8
CEE Technical Elective Courses.....	6

⁴Students must complete all five Group A Courses, listed below. The order in which they are taken will dictate the choice of technical elective courses (as they are prerequisites for various technical elective courses).

Group A Courses

CEE 3080 Design of Reinforced Concrete Structures (Sp).....	3
CEE 3210 Introduction to Transportation Engineering (Sp).....	3
CEE 3430 Engineering Hydrology (Sp).....	3
CEE 3640 Water and Wastewater Engineering (Sp).....	4
CEE 4300 Engineering Soil Mechanics (Sp).....	4

⁵Civil Engineering students are required to complete a Senior Design elective course concurrent with CEE 4870. In addition, they must complete five Technical Elective Courses (one of which must be selected from Group B), for a total of 15 credits. Following is a list of Technical Elective Courses and Senior Design Elective Courses.

Technical Elective Courses (18 credits minimum required)

Students in the Civil Engineering program must complete a senior design elective (see list below). They must also establish proficiency in *at least four* areas of Civil Engineering by taking a *minimum of two courses* in each area. Proficiency in **Environmental Engineering** is established by taking BIOL 1010; and CEE 3610, 3640. Proficiency in **Structures** is established by taking ENGR 2000, 2040; and CEE 3010, 3020, 3080. Proficiency in **Fluid Mechanics and Hydraulics** is established by taking ENGR 2020; and CEE 3430, 3500, 3510. Students will also demonstrate proficiency in *one of* Geotechnical Engineering, Transportation Engineering, or Water Resources Engineering by taking a Group B course (see list below).

Proficiency in **Geotechnical Engineering** is established by taking ENGR 2020; GEOL 1150; CEE 4300; and *either* CEE 5350 or 5380. Proficiency in **Transportation Engineering** is established by taking CEE 3210; and *one of* CEE 5190, 5220, 5230, or 5240. Proficiency in **Water Resources Engineering** is established by taking CEE 3430; and *one of* CEE 5450, 5460, 5470, or 6440.

The sum of the Group B class, the Senior Design Elective, and other technical electives from the approved list must be at least 18 credits.

CEE 3670 Transport Phenomena in Bio-Environmental Systems (Sp).....	3
CEE 3780 Solid and Hazardous Waste Management (F).....	3
CEE 5010 Matrix Analysis of Structures and Introduction to Finite Elements (F).....	3
CEE 5050 Design of Wood and Masonry Structures (Sp).....	3
CEE 5070 Structural Steel Design (F).....	3
CEE 5080 Numerical Methods in Elasticity (F).....	3
CEE 5100 Infrastructure Evaluation and Renewal (Sp).....	3
CEE 5190 Geographic Information Systems for Civil Engineers (Sp).....	3
CEE 5220 Traffic Engineering (Sp).....	3
CEE 5230 Geometric Design of Highways (Sp).....	3
CEE 5240 Urban and Regional Transportation Planning (F).....	3
CEE 5350 Foundation Analysis and Design (F).....	3
CEE 5380 Earthquake Engineering (Sp).....	3
CEE 5430 Groundwater Engineering (F).....	3
CEE 5450 Hydrologic Modeling (Sp).....	3
CEE 5460 Water Resources Engineering (F).....	3
CEE 5470 Sedimentation Engineering (Sp).....	3
CEE 5500 Open Channel Hydraulics with an Emphasis on Gradually Varied Flow (F).....	3
CEE 5540 Hydraulic Structures Design (F).....	3
CEE 5550 Hydraulics of Closed Conduits (Sp).....	3
CEE 5690 Natural Systems Engineering.....	3
CEE 5700 Field Sampling Techniques for Natural Systems Engineering (F).....	2
CEE 5860 Air Quality Management (F).....	3
CEE 5870 Hazardous Waste Incineration (Sp).....	2
CEE 5880 Remediation Engineering (F).....	3
CEE 5900 Cooperative Practice II (F,Sp,Su).....	3
MAE 2060 Material Science (F,Sp).....	3
MAE 2400 Thermodynamics I (Sp,Su).....	3

Department of Civil and Environmental Engineering

Senior Design Elective Courses

CEE 3780 Solid and Hazardous Waste Management (F)	3
CEE 5070 Structural Steel Design (F)	3
CEE 5230 Geometric Design of Highways (Sp)	3
CEE 5350 Foundation Analysis and Design (F)	3
CEE 5460 Water Resources Engineering (F)	3
CEE 5470 Sedimentation Engineering (Sp)	3
CEE 5540 Hydraulic Structures Design (F)	3

Group B Elective Courses

CEE 5190 Geographic Information Systems for Civil Engineers (Sp)	3
CEE 5220 Traffic Engineering (Sp)	3
CEE 5230 Geometric Design of Highways (Sp)	3
CEE 5240 Urban and Regional Transportation Planning (F)	3
CEE 5350 Foundation Analysis and Design (F)	3
CEE 5380 Earthquake Engineering (Sp)	3
CEE 5450 Hydrologic Modeling (Sp)	3
CEE 5460 Water Resources Engineering (F)	3
CEE 5470 Sedimentation Engineering (Sp)	3

Undergraduate Course Requirements for Environmental Engineering

Pre-engineering Program: Freshman and Sophomore

Freshman Year (29-31 credits)

Fall Semester (15 credits)

MATH 1210 (QL) ⁷ Calculus I	4
BIOL 1210 (BLS) ^{6,7} Biology I	4
CEE 1880 ⁷ Civil and Environmental Engineering Orientation and Computer Applications	1
CEE 2240 ⁷ Engineering Surveying	3
University Studies Breadth Course	3

Spring Semester (14-16 credits)

CHEM 1210 ⁷ Principles of Chemistry I	4
CHEM 1230 ⁷ Chemical Principles Laboratory I	1
MATH 1220 (QL) ⁷ Calculus II	4
ETE 2270 ⁷ Computer Engineering Drafting	2
PHYX 2200 Elements of Mechanics (prereq. to PHYX 2220)	(2)
University Studies Breadth Course	3

Sophomore Year (32 credits)

Fall Semester (16 credits)

MATH 2250 (QI) ⁷ Linear Algebra and Differential Equations	4
ENGR 2000 ⁷ Engineering Mechanics Statics	2
ENGR 2200 ⁷ Engineering Numerical Methods I	3
CHEM 2300 ⁷ Principles of Organic Chemistry	3
PHYX 2220 (BPS/QI) ⁷ General Physics—Science and Engineering II (prereq: AP Physics or PHYX 2200)	4

Spring Semester (16 credits)

ENGR 2020 ⁷ Engineering Mechanics Dynamics	3
ENGR 2040 ⁷ Strength of Materials	2
ENGL 2010 (CL) ⁷ Intermediate Writing: Research Writing in a Persuasive Mode	3
MAE 2400 ⁷ Thermodynamics I	3
CEE 2890 ⁷ Environmental Engineering Sophomore Seminar	1
BIOL 3300 (BLS) ⁶ General Microbiology	4

⁶The Breadth Life Science (BLS) area in the University Studies Program is satisfied by the combination of BIOL 1210 and 3300.

⁷These courses are required for admission to the Professional Engineering Program (PEP).

Professional Engineering Program: Junior and Senior

Junior Year (34 credits)

Fall Semester (17 credits)

CEE 3030 Uncertainty in Engineering Analysis	2
CEE 3500 Civil and Environmental Engineering Fluid Mechanics	3
CEE 3610 ⁸ Environmental Management	3
CEE 3780 Solid and Hazardous Waste Management	3
CEE 3870 ⁸ Professional/Technical Writing in Civil and Environmental Engineering	2
SOIL 3000 Fundamentals of Soil Science	3

Spring Semester (17 credits)

CEE 3430 Engineering Hydrology	3
CEE 3510 Civil and Environmental Engineering Hydraulics	3
CEE 3640 Water and Wastewater Engineering	4
CEE 3670 Transport Phenomena in Bio-Environmental Systems	3
CEE 3890 Environmental Engineering Design I	1
University Studies Breadth Course	3

Senior Year (30-31 credits)

Fall Semester (16 credits)

PUBH 3310 Occupational Health and Safety	3
CEE 4200 Engineering Economics	2
CEE 4790 (CI) ⁹ Environmental Engineering Design II	2
CEE 5610 Environmental Quality Analysis	3
CEE 5860 Air Quality Management	3
CEE Senior Design Elective Course ⁹	3

Spring Semester (14-15 credits)

CEE 4890 (CI) Environmental Engineering Design III (Sp)	2
Technical Elective Course (Area 1, 2, or 3) ¹⁰	2
Technical Elective Course (Area 4 or 5) ¹⁰	2
University Studies Breadth Course	3
University Studies Depth Courses (DHA and DSS)	5-6

⁸CEE 3610 and 3870 must be taken concurrently.

⁹Environmental Engineering students are required to complete a Senior Design elective course concurrent with CEE 4790. Available Senior Design elective courses are listed below.

¹⁰Environmental Engineering students must select at least two Technical Elective courses (totaling 4 credits) chosen from the specialty areas (options) listed below.

Senior Design Elective Courses

CEE 5690 Natural Systems Engineering (F)	3
CEE 5810 Biochemical Engineering (F)	3
CEE 5830 Management and Utilization of Biological Solids and Wastewater (F)	3
CEE 5880 Remediation Engineering (F)	3

Technical Elective Courses

Solids—Area 1

CEE 5670 Hazardous Chemicals Handling and Safety (Sp)	2
CEE 5680 Soil-based Waste Management (Sp)	2
CEE 5730 Analysis and Fate of Environmental Contaminants (Sp)	3
CEE 5830 Management and Utilization of Biological Solids and Wastewater (Sp)	3
CEE 5870 Hazardous Waste Incineration (Sp, Alt Years)	2
CEE 5880 Remediation Engineering (F)	3

Water—Area 2

CEE 5430 Groundwater Engineering (F)	3
CEE 5620 Aquatic Chemistry (F)	3
CEE 5730 Analysis and Fate of Environmental Contaminants (Sp)	3
CEE 5810 Biochemical Engineering (F)	3

Air—Area 3

BMET 4300 General Meteorology (F)	3
CEE 5710 Pollution Prevention and Industrial Ecology (Sp, Alt Years)	2

Department of Civil and Environmental Engineering

CEE 5750 Air Quality Measurements (Sp)	2
CEE 5790 Accident and Emergency Management (Sp)	3
CEE 5870 Hazardous Waste Incineration (Sp, Alt Years)	2

Natural Systems—Area 4

AWER 4500 Freshwater Ecology (F)	3
AWER 4530 Water Quality and Pollution (Sp)	3
CEE 5690 Natural Systems Engineering (F)	
CEE 5700 Field Sampling Techniques for Natural Systems Engineering (F)	2

Occupational Safety and Health—Area 5

PUBH 4310 Industrial Hygiene Recognition of Hazards (F)	4
PUBH 4320 Industrial Hygiene Chemical Hazard Evaluation (Sp)	3
PUBH 4330 Industrial Hygiene Physical Hazards (Sp)	3
PUBH 5330 (QI) Industrial Hygiene Chemical Hazard Control (F)	3
CEE 5670 Hazardous Chemicals Handling and Safety (F)	2
CEE 5710 Pollution Prevention and Industrial Ecology (Sp)	2
CEE 5790 Accident and Emergency Management (Sp)	3

Departmental Honors

Students who would like to experience greater academic depth within their major are encouraged to enroll in departmental honors. Through original, independent work, Honors students enjoy the benefits of close supervision and mentoring, as they work one-on-one with faculty in select upper-division departmental courses. Honors students also complete a senior project, which provides another opportunity to collaborate with faculty on a problem that is significant, both personally and in the student's discipline. Participating in departmental honors enhances students' chances for obtaining fellowships and admission to graduate school.

In the Department of Civil and Environmental Engineering, departmental honors can be earned by completing 20 credits of upper-division honors engineering courses. Students should work with the department in selecting appropriate courses.

Interested students should contact the Honors Program, Merrill Library 374, (435) 797-2715, honors@cc.usu.edu. Additional information can be found online at: <http://www.usu.edu/honors/>

Additional Information

For more information about Bachelor of Science requirements and the sequence in which courses should be taken, see major requirement sheet, available from the Civil and Environmental Engineering Department, or online at: <http://www.usu.edu/ats/majorsheets/>

Concurrent BS/Master's Program

The concurrent BS/Master's program allows engineering students to begin taking graduate-level classes during their senior year. This permits them to complete requirements for *both* the BS degree *and* the master's degree concurrently during two years. Students in this program have a greater selection of graduate courses, since many graduate courses are taught during alternate years. In addition, the student's senior design project could be a start for a graduate design project or thesis. After completing their BS degree, students in the program can earn a master's degree in only one additional year.

Both the BS and the master's degree can generally be earned with 150 total credits, although students should note that a Plan C MS requires 3 extra credits. Finally, students with a master's degree can expect a much higher starting salary following graduation. (For more

information, see *College of Engineering* section of this catalog, pages 113-114.)

Graduate Programs

The ME degree emphasizes professional practice and coursework. A minimum of 30 credits of technical and scientific coursework is required. The MS degree emphasizes research and the preparation of a significant publication. A minimum of 30 credits, 6 to 9 of which shall be thesis research, is required for an MS. In special cases, as decided by the student's supervisory committee, a second MS is available with a Plan B option, which requires 30 credits, including 3 credits of CEE 6970, Thesis Research. The CE degree, which prepares students for professional engineering careers, requires 60 credits beyond the bachelor's degree, or 30 credits beyond the master's degree, including a technical engineering report. The PhD degree represents high scholarly achievement demonstrated by independent research and competence in an area of specialization approved by the student's supervisory committee.

Admission Requirements

See general admission requirements, pages 93-94. Admission committees consider GRE scores and experience, undergraduate record and curriculum, and formal recommendations. A student without an undergraduate civil and environmental engineering background may be required to complete selected undergraduate courses prior to admission as a fully matriculated graduate student.

Graduate Program Divisions

The graduate program in the Department of Civil and Environmental Engineering is administered through five academic divisions, as described below.

Structural Engineering

The structural engineer is involved in the design, construction, repair, and retrofit of all types of structures: buildings, bridges, dams, and many others. The safety of the structures we occupy and utilize every day is the responsibility of structural engineers. They must be able to evaluate the loads placed on a structure, determine their effects on the structure, and select the appropriate materials and structural elements, or repair strategy, to withstand these loads. Today's structural engineer is using new space materials in the design of new structures or the retrofit of older structures.

Mathematics, physics, and materials science constitute a foundation for structural engineering. Structural analysis and design are added to this foundation and become the focus of the structural engineering program. Graduate students in the structures program also engage in structural mechanics, numerical methods, structural dynamics, geotechnical engineering, and the study of new structural materials. Current research in the structures area is focusing on the dynamic characteristics of structures, their potential response to earthquakes, and new seismic retrofit measures, using advanced composite materials, for older structures. Materials research is focusing on cementitious materials and constitutive modeling.

Geotechnical Engineering

Engineering studies of soils are concerned with the physical and engineering properties of soils and how these are related to engineering projects.

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Traditional geotechnical engineering includes the application of engineering principles to the analysis and/or design of building foundations, earth embankments, retaining walls, drainage systems, earthquake motion, buried structures, and other systems involving soil and rock. Engineers and architects cannot ignore the problems of investigating properties of soils in connection with engineering construction. Undergraduate and graduate courses offered by the department provide the basic knowledge necessary for the design of foundations and various types of earth structures. Fundamental concepts and their application are emphasized so that the student will be properly trained for his or her initial job, as well as being prepared to understand future development in this field.

The Geotechnical Engineering Division, in cooperation with the Environmental Engineering Division, is offering a new program in Geoenvironmental Engineering. This new program uses the strengths of both divisions to provide a program involving the geotechnical aspects of hazardous waste management, the investigation of hazardous waste sites, and the design of hazardous waste containment systems.

The geotechnical division has a strong research program. Current research projects in this division include studies on liquefaction, seismic slope stability, pile foundations, landslides, mechanically stabilized embankments, risk analysis of dams, finite element analysis of soil-structure systems, and the long-term properties of clay soils used in hazardous waste containment systems.

Water Engineering

The water engineering program is a multidisciplinary graduate program in the College of Engineering and is intended to enable engineers and scientists interested in water to obtain graduate degrees in the areas of fluid mechanics and hydraulics, hydrology, groundwater, and water resources engineering. Core courses and departmental offerings cover these fundamental areas, as well as essential numerical and statistical methods. The water engineering faculty are committed to a strong academic program. The curriculum offered is one of the most comprehensive offered in the U.S. Elements of ongoing research projects are routinely and effectively incorporated into the classes. The program combines training, research, and experience to understand the water issues and water resources management challenges in the United States and internationally. Graduate students can supplement departmental offerings by selecting courses in Mathematics and Statistics; Computer Science; Aquatic, Watershed, and Earth Resources; Environment and Society; Forest, Range, and Wildlife Sciences; Economics; Political Science; Geology; Biological and Irrigation Engineering; Mechanical and Aerospace Engineering; Plants, Soils, and Biometeorology; Biology; Chemistry and Biochemistry; and Physics. This ensures that graduates are well-grounded in the fundamentals, but have a breadth of training and are prepared to contribute professionally to the solution of multidisciplinary local, national, and international water problems. Graduate students in the water program have the opportunity for research support through the Utah Water Research Laboratory (UWRL) while working on theses or dissertations. Excellent laboratory and computing facilities are available. Strong, continuous state and federal research funding keeps the research topics and facilities current. Specialty areas within the program comprise fluid mechanics and hydraulics, hydrology, groundwater, and water resources engineering.

Fluid mechanics and hydraulic engineering covers both fundamental principles and theory and their applications in a variety of engineering fields. Elementary fluid mechanics, based on fundamental principles of conservation of mass, energy, and momentum, is the logical core for all water-related engineering programs. Consequently, other

specialties in water engineering study fluid mechanics. Students specializing in fluid mechanics and hydraulics emphasize theoretical fluid mechanics, hydraulic design, numerical methods, and laboratory hydraulic techniques. A good variety and balance of courses supporting research in theoretical fluid mechanics, open channel hydraulics, hydraulic design, transients, sedimentation, municipal water system design, and cavitation are available at the graduate level. Graduates in fluid mechanics and hydraulics find employment in a broad range of professional engineering fields, including consulting, university teaching and research, and state and federal government agencies.

Hydrology is a branch of geoscience concerned with the origin, distribution, movement, and properties of waters of the earth. The hydrologic cycle encompasses the atmosphere, the land surface, lakes and oceans, and the subsurface. Complex, interacting processes at varied time and space scales describe the hydrologic cycle. The concepts and practice of hydrology derive from an integration of field observations, laboratory investigations, and conceptual, mathematical, chemical, statistical, and probabilistic models.

The hydrology program at USU has strength in both theoretical and applied aspects of modern hydrology. Past and present research focuses on a broad spectrum of hydrologic problems. These range from climate modeling, rainfall processes, floods, droughts, terminal lake analyses, soil erosion, and stream water quality models to groundwater contamination characterization and remediation and watershed analyses. A particular emphasis of the program is on an understanding of the global water and energy cycles at nested scales from the hemisphere to the continent to the watershed from a holistic perspective that recognizes the two-way linkages between water reservoirs and fluxes through oceans, atmosphere, land surface and subsurface, and biota.

Groundwater engineering is concerned with fluid flow and transport of contaminants in the subsurface environment. It encompasses the theory of flow in porous media; groundwater hydrology; fate and transport of contaminants in subsurface; and analytical, numerical, and stochastic modeling of such processes. Emphasis is placed on the quantitative analysis of physical and chemical principles governing these processes and on the application of these principles to practical field problems, with all their difficulties related to the complex structure of subsurface formations. Examples of such problems include groundwater supply and management, capture zone analysis, well hydraulics, subsurface cleanup technologies, health risk assessment, and analysis and remediation of groundwater contamination. These problems are of a multidisciplinary nature, and their solutions require a multidisciplinary approach, involving, among others, soil and water chemistry, chemical engineering, and economics. The groundwater professional is an important team player in solving such problems.

Water Resources Engineering prepares engineers to be lead members in water resources planning teams, often charged with coordinating the information and concepts supplied from other disciplines. This need for breadth requires considerable flexibility in the training and arrangement of degree programs.

Water resources engineers draw principles from hydrology, fluid mechanics, hydraulics, environmental engineering, economics, ecology, political science, and other disciplines in the design and operation of projects and nonstructural methods for water resources planning and management. They need a sound understanding of how water storage, delivery, and other management systems function; of criteria used in evaluating and selecting among alternatives; of the techniques of operations research that can be used in systems design; and of the institutional aspects of decision-making in the public sector. A focus area of the program is to develop decision support systems

Department of Civil and Environmental Engineering

for sustainable water quantity and quality management in the United States and in developing regions of the world. Evolving information sources and tools, such as spatial data sets encoded in geographical information systems, climate forecasts, and cognitive models of the human decision process and societal group dynamics, are being integrated in representative institutional contexts.

An internationally-recognized specialized program has been developed in dam safety risk assessment. Students take classes in dam engineering; hydrology and hydraulics; geotechnical engineering; geology; decision analysis; risk assessment; probability and statistics; and natural resources economics, planning, and management. Students work on practical applications, as well as research projects, for improving the state-of-the-art.

Environmental Engineering

The Division of Environmental Engineering is a multidisciplinary graduate program in the College of Engineering and provides coursework and research experience to enable engineers and scientists interested in the environment to obtain graduate degrees relating to potable water and waste treatment, toxic and hazardous wastes management, air quality management, natural systems engineering, and environmental impact assessment. The program provides an interdisciplinary educational approach to fundamental principles that can be applied to environmental phenomena. Research and training projects are a part of the program and provide the student with appropriate research experience leading to a thesis or dissertation.

Hazardous Waste Management. This specialization has been developed within the broader scope of the environmental engineering program to provide an integrated approach for students with a BS in engineering or natural sciences to deal with the complex issues of toxic and hazardous waste. Aspects of toxic/hazardous waste management, including characterization, treatment, disposal, control, monitoring, and environmental impacts, are dealt with in this program.

Natural Systems Engineering is the study of the interaction of engineered systems with nature, emphasizing impacts to aquatic ecosystems. Techniques include assessment of aquatic habitat through computer simulation and model verification, quantification of aquatic habitat using remote sensing systems, and data analysis and display through integrated statistical and GIS approaches. These tools are used to evaluate impacts on threatened and endangered species, habitat enhancement, instream flow assessments, fish habitat, stream sediment, and hydraulic features.

A *bioprocess engineering* program has been developed as a cooperative effort between the Division of Environmental Engineering and the Biological and Irrigation Engineering Department. This program provides students with specialized coursework and research experience in areas of bioreactor processing of environmental materials and engineering scale-up of biologically-based environmental reactions. Areas of specialization include waste to energy, fermentation, composting, and industrial waste (agricultural and chemical) reuse, recycling, and technologies based on biological processes, as well as engineering optimization of aquatic habitats.

Transportation Engineering

The graduate program in Transportation Engineering offers education and research opportunities in transportation systems planning, design, and management. It is designed to enable aspiring planners, engineers, and managers to obtain advanced degrees while specializing in infrastructure management, traffic network analysis, facility design, traffic operations, transportation economics and finance,

and project appraisal. Up-to-date computer and laboratory facilities, as well as the Transportation Division's close links with local and state transportation agencies, enable students to gain hands-on experience and practical perspectives.

Past and present research undertaken by the Transportation Division faculty and researchers ranges from microscopic traffic flow simulation, dynamic route assignment, and network reliability to traffic accident modeling, pavement management, video image processing, and intelligent transportation systems. The focus remains on efficient and effective solutions to transportation problems.

Transportation Division course offerings expose students to the theoretical and practical aspects of goods and passenger transportation. State-of-the-art analytical tools and new research findings are introduced into the courses through periodic revision of notes, examples, problem sets, and computer software. Students are encouraged to design their own programs of study according to their personal and professional goals. Due to the multi-disciplinary nature of transportation, students are encouraged to include in their program of study course offerings from other programs in CEE, as well as from Mathematics and Statistics, Environment and Society, Economics, Business Administration, and Sociology.

Financial Assistance

Both departmental and formal grant support are available to graduate students and are awarded on a competitive basis. Students requesting financial support should apply to the department by March 15 for the coming academic year.

A number of fellowships are available through the University and the department. Teaching assistantships are available through the department and research assistantships are available through the Utah Water Research Laboratory and departmental faculty members who have ongoing projects or who hold special research grants from the University, private companies, or state and federal agencies.

Acceptance to pursue graduate studies in the Civil and Environmental Engineering Department does not guarantee the student financial assistance. Inasmuch as funds are limited, the assistantships are awarded by the department to cover specific teaching assignments and by the faculty members to provide for research as funds are available.

Civil and Environmental Engineering Faculty

Professors

Loren R. Anderson, geotechnical engineering
A. Bruce Bishop, engineering systems and planning
David S. Bowles, risk assessment, hydrology, water resources engineering
William J. Doucette, environmental analytical chemistry
R. Ryan Dupont, hazardous waste management, bioremediation
William J. Grenney, Advanced Center for Transportation Studies
Christine E. Hailey, Associate Dean of College of Engineering, fluid and thermal sciences, engineering education
Thomas B. Hardy, ecological system modeling, statistical analysis
Jagath J. Kaluarachchi, subsurface hydrology, contaminant transport
Marian W. Kemblowski, subsurface hydrology and transport processes
Mac McKee, water resources planning and analysis
William J. Rahmeyer, hydraulics, hydraulic structures, scour and erosion
David K. Stevens, treatment process analysis

Department of Civil and Environmental Engineering

David G. Tarboton, hydrology and water resources
Kevin C. Womack, structural mechanics
Muzz Yener, structural engineering and mechanics

Research Professor

Darwin L. Sorensen, aquatic microbiology

Professors Emeriti

Jay M. Bagley, hydrology, water resources
W. O. Carter, structures
Calvin G. Clyde, fluid mechanics and groundwater
Irving S. Dunn, geotechnical engineering
Gordon H. Flammer, hydraulics
Daniel H. Hoggan, hydrologic and hydraulic modeling
Trevor C. Hughes, water resources systems analysis
C. Earl Israelsen, hydrology, hydraulics, water resources, erosion control
Roland W. Jeppson, numerical modeling
Fred W. Kiefer, Jr., geotechnical engineering
Elliot Rich, structural engineering
J. Paul Riley, water resources systems, hydrology
J. Paul Tullis, hydraulics, hydraulic structures, and hydromachinery
Reynold K. Watkins, geotechnical engineering

Adjunct Professors

Lloyd H. Austin, water resources
Steve C. Chapra, water-quality modeling
George G. Goble, deep foundations and structural dynamics
Roger D. Hansen, water resources
Jeffrey R. Keaton, geotechnical engineering, engineering geology
Upmanu Lall, climate modeling, statistical hydrology, water resource systems
Neil Parrett, performance and safety of dams
Norman E. Stauffer, Jr., engineering hydrology and computer modeling
Alan Steinberg, road maps for intelligence
Daniel A. Stone, environmental chemistry

Associate Professors

James A. Bay, geotechnical engineering
Joseph A. Caliendo, geotechnical engineering
Anthony Chen, network analysis and logistics, transportation planning
Marvin W. Halling, structural dynamics, earthquake engineering
Sonia S. Manuel-Dupont, technical writing
Randal S. Martin, environmental engineering (air pollution)

Michael J. McFarland, environmental engineering
Gilberto E. Urroz-Aguire, hydraulics, hydraulic structures

Research Associate Professors

Joan E. McLean, fate and behavior of metals in subsurfaces
Robert T. Pack, geomatics and engineering geology

Adjunct Associate Professors

Danny Marks, snow hydrology
Eva C. Nieminski, water quality
Anthony Turhollow, transportation

Associate Professor Emeritus

J. Derle Thorpe, engineering materials, measurements

Assistant Professors

Paul J. Barr, reinforced concrete, bridge design
Luis Bastidas, hydrology
Henry X. Liu, traffic modeling and simulation, intelligent transportation systems
Laurie S. McNeill, environmental engineering (drinking water)
Keri L. Ryan, structural dynamics, structural control
Blake P. Tullis, hydraulics, hydraulic structures, and hydromachinery

Research Assistant Professors

Sanjay Chauhan, dam safety, risk assessment, hydrologic modeling
Michael C. Johnson, hydraulics

Adjunct Assistant Professors

Steve Barfuss, hydraulics
Arnfinn J. Emdal, geotechnical
Charles H. Luce, forest hydrology

Affiliate Faculty

Robert W. Hill, professor, Biological and Irrigation Engineering
John E. Keith, professor, Economics
Jack Keller, professor emeritus, Biological and Irrigation Engineering
Judith L. Sims, fate and behavior of organic chemicals
Ronald C. Sims, hazardous waste management
Wynn R. Walker, professor, Biological and Irrigation Engineering

Course Descriptions

Civil and Environmental Engineering (CEE), pages 479-486

Classics Minor

Coordination: Mark L. Damen, Susan O. Shapiro, and Frances B. Titchener, Department of History

Location: Main 323

Phone: (435) 797-1290

FAX: (435) 797-3899

E-mail: mdamen@hass.usu.edu

WWW: <http://www.usu.edu/history/classics/index.htm>

An academic minor is available in the field of **Classical Studies** with three areas of emphasis: **Classical Civilization**, **Latin Language**, and **Greek Language**. From the ancient civilizations of the Mediterranean area are derived our government, literature, sciences, and laws. The classical world is the backdrop of the modern world. In association with various majors, the Classics Minor is designed to enhance intellectual abilities and practical skills.

Requirements

Requirements for the three emphasis areas are as follows:

Classics Minor with Emphasis in Civilization

Twenty-one credits of coursework are required. All students must take:

HIST 3130 (CI/DHA) Greek History.....	3
HIST 3150 (CI) Roman History (Sp).....	3

One of the following two courses in ancient archaeology is required:

HIST 3110 (CI/DHA) Ancient Near East.....	3
ANTH 1030 (BSS/CI) World Archeology (F, Sp)	3

One of the following three ancient literature courses is required:

CLAS 1100 The Latin and Greek Element in English (F).....	3
CLAS 3210 Classical Mythology (Sp)	3
THEA 5290 Special Topics in Theatre History and Literature (F, Sp)....	3

One of the following two ancient art courses is required:

HIST 4210 Celtic Europe (F, Sp)	3
ART 4710 Greek and Roman Art	3

One of the following three ancient thought courses is required:

HIST 3140 Greek Intellectual History: Tradition, Challenge, and Response.....	3
POLS 4310 History of Political Thought I (Sp)	3
PHIL 3100 (CI) Ancient Philosophy (F)	3

The remaining 3 credits are elective and may include any of the courses listed above.

Classics Minor with Emphasis in Latin Language

Thirteen credits are required. All students must complete HIST 3150 (Roman History) and 7 credits of upper-division (3000- and 4000-level) courses in Latin language. They must also complete *one* of the following courses:

ART 4710 Greek and Roman Art	3
CLAS 1100 The Latin and Greek Element in English (F).....	3
CLAS 3210 Classical Mythology (Sp)	3
HIST 4210 Celtic Europe (F, Sp)	3
THEA 5290 Special Topics in Theatre History and Literature (F, Sp)....	3

Classics Minor with Emphasis in Greek Language

Thirteen credits are required. All students must complete HIST 3130 (Greek History) and 7 credits of upper-division (3000- and 4000-level) courses in classical Greek language. They must also complete *one* of the following courses:

ART 4710 Greek and Roman Art	3
CLAS 1100 The Latin and Greek Element in English (F).....	3
CLAS 3210 Classical Mythology (Sp)	3
PHIL 3100 (CI) Ancient Philosophy (F)	3
THEA 5290 Special Topics in Theatre History and Literature (F, Sp)....	3

Approved courses for the various minors are listed in the brochure titled *Classical Studies*. Brochures are available from the Department of History, Main 323.

Course Descriptions

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Greek (GRK), page 530

Latin (LATN), page 548

Department of Communicative Disorders and Deaf Education

Department Head: James C. Blair
Location: Lillywhite 103
Phone: (435) 797-1388
FAX: (435) 797-0221
E-Mail: jimbo@cc.usu.edu
WWW: http://www.coe.usu.edu/comd

Assistant Department Head and Advisor for Speech-Language Pathology and Audiology:
Dee R. Child, Lillywhite 105, (435) 797-2318, deec@cc.usu.edu

Advisor for Deaf Education:
Jan Kelley-King, Lillywhite 40, (435) 797-5718, jankin@cc.usu.edu

Degrees offered: Bachelor of Science (BS), Bachelor of Arts (BA), Master of Science (MS), Master of Arts (MA), Master of Education (MEd), and Educational Specialist (EdS) in Communicative Disorders and Deaf Education; Doctorate of Audiology (AuD)

Undergraduate areas of focus: BS, BA—Clinical and Educational Audiology, Education of the Deaf and Hard of Hearing, Speech-Language Pathology. The focus in Education of the Deaf and Hard of Hearing includes a composite degree in Deaf Education/Elementary Education.

Graduate specializations: MS, MA, MEd—Audiology, Early Childhood Communicative Disorders, Speech-Language Pathology; MEd—Education of the Deaf and Hard of Hearing; EdS—Audiology

Undergraduate Programs

Objectives

Three main objectives of the Department of Communicative Disorders and Deaf Education are (1) to train competent speech-language pathologists, educators of the deaf and hard of hearing, and clinical-educational audiologists capable of receiving state and national licensure; (2) to provide clinical services to individuals with speech-language deficits or hearing loss in the University population or in the community; and (3) to provide research opportunities for students relating to communicative problems of individuals. The programs in both Speech-Language Pathology and Clinical-Educational Audiology are fully accredited by the Council on Academic Accreditation of the American Speech-Language-Hearing Association (ASHA). The program in Education of the Deaf and Hard of Hearing is accredited by the Council on Education of the Deaf. All department programs hold Utah State Office of Education approval and NCATE accreditation.

Requirements

Departmental Admissions Requirements (Audiology and Speech-Language Pathology)

Any accepted student at Utah State University may major in Communicative Disorders and Deaf Education (COMD-DE) during the freshman and/or sophomore years. However, during the first semester of the junior year, the student must formally apply for admission into the COMD-DE undergraduate professional preparation program. Application forms for admission into COMD-DE will be disseminated in class during the first semester of the junior year. As part of the application process, each student will complete the College of Education and Human Services Writing Examination. The student will be accepted if cumulative grade point average is 3.0 or higher, University Studies credits are within 15 credits of completion,

the College of Education and Human Services Writing Examination has been taken and passed, and all COM-DE courses taken to this point have grades higher than C+. Students who are accepted into the undergraduate program must maintain the acceptance standards each semester in order to continue in the major.

Transfer Students or students applying for admission into the program subsequent to the fall semester of their junior year must receive approval from the department head before beginning their matriculation in major classes.

Admission into the College of Education and Human Services teacher education program is necessary before the student may take licensure courses taught in the departments of Elementary Education, Special Education and Rehabilitation, and Secondary Education, which are supportive of the major. Admission into the teacher education program is also required prior to taking the Communicative Disorders clinical practicum coursework. Application to the teacher education program typically takes place at the beginning of the graduate program.

Departmental Admissions Requirements (Education of the Deaf and Hard of Hearing)

Students admitted to the University in good standing may major in the composite degree in Deaf Education/Elementary Education (DEEE). Upon completion of 30 semester credits, students may apply for admission to the teacher education program. Admission criteria include a cumulative GPA of 2.75, a passing score on the College of Education and Human Services Writing Examination, a speech and hearing test, successful performance on the ACT exam, computer skills competency, and high potential as a teacher, as judged by performance in a small-group interview. Students must also complete the following courses prior to application: ELED 1000, ENGL 1010, FCHD 1500, MATH 1050, one Breadth American Institutions (BAI) course, one Breadth Physical Sciences (BPS) course, and one Breadth Humanities (BHU) or Breadth Creative Arts (BCA) course. Students who are accepted into the teacher education program may continue with the Deaf Education coursework, if they continue to improve in their use of American Sign Language, and if they continue to receive grades of no less than a B- in all of their COMD courses.

Bachelor's Degree in Communicative Disorders and Deaf Education

There are two tracks available within the department: (1) **communicative disorders**, which includes emphases in *audiology* and *speech-language pathology*, and (2) **education of the deaf and hard of hearing**. Though the BS or BA is available in both tracks, the student should be aware that there is no professional employment licensure in either communicative disorders or education of the deaf and hard of hearing at the bachelor's level.

Suggested Semester Schedule for Communicative Disorders and Deaf Education Majors (Audiology and Speech-Language Pathology)

Note: A minimum 3.0 overall GPA is required for admission to the professional program during the junior year.

Junior Year (30 credits)

Fall Semester (15 credits)

COMD 2400 Orientation and Observation	1
COMD 2500 Language, Speech, and Hearing Development	3
COMD 3100 Fundamentals of Anatomy for Speech and Language	3
COMD 3500 Phonetics/Developmental Phonology	3
SPED 4000 Education of Exceptional Individuals	2
Electives	3

Department of Communicative Disorders and Deaf Education

Spring Semester (15 credits)

COMD 3120 Disorders of Articulation and Phonology	3
COMD 3400 Acoustics and Anatomy of the Ear	3
COMD 3650 Clinical Processes and Behavior	2
COMD 5100 Language Science	3
PSY 1400 Analysis of Behavior: Basic Principles	3
PSY 1410 Analysis of Behavior: Basic Principles Lab	1

Senior Year (28 credits)

Fall Semester (16 credits)

COMD 2910 (CI) Sign Language I (Majors)	4
COMD 3700 Basic Audiology	3
COMD 5070 Speech Science	3
ENGL 3070 (DHA) Perspectives in Folklore	3
STAT 1040 (QL) Introduction to Statistics	3

Spring Semester (12 credits)

COMD 5010 School-Based Practices	2
COMD 5200 Language Assessment and Intervention for Preschool Children	4
COMD 5330 Aural Rehabilitation	3
Electives	3

Suggested Schedule for Deaf Education/ Elementary Education Composite Majors

Students wishing to obtain teacher certification in Elementary Education and Deaf Education must complete the undergraduate requirements for the composite major and complete a two-semester graduate program during which student teaching requirements are fulfilled. There is no certification available at the bachelors' degree level.

Freshman Year (34 credits)

Fall Semester (15 credits)

ENGL 1010 (CL) Introduction to Writing: Academic Prose	3
Breadth American Institutions (BAI) course (major approved)	3
Breadth Humanities (BHU) course (major approved)	3
Breadth Life Sciences (BLS) course (major approved)	3
Breadth Physical Sciences (BPS) course (major approved)	3

Spring Semester (19 credits)

COMD 2910 (CI) Sign Language I	4
ELED 1000 Orientation to Elementary Education	3
FCHD 1500 (BSS) Human Development Across the Lifespan	3
MATH 1050 (QL) College Algebra	4
HEP 3500 Elementary School Health Education (2 cr) or	
HEP 2000 First Aid and Emergency Care (2 cr)	2
Breadth Creative Arts (BCA) course (major approved)	3

Sophomore Year (36 credits)

Fall Semester (18 credits)

Level II Courses (Students must be admitted to the program.)

ELED 3000 (CI) Foundation Studies and Practicum in Teaching and Classroom Management Level II	8
SPED 4000 Education of Exceptional Individuals	2
PSY 3660 Educational Psychology for Teachers	2
INST 4010 Principles and Practices of Technology for Elementary Teachers	3
ELED 3100 Teaching Reading I	3

Spring Semester (18 credits)

ENGL 2010 (CL) Intermediate Writing: Research Writing in a Persuasive Mode	3
Breadth Physical Sciences (BPS) course (major approved)	3
Breadth Social Sciences (BSS) course (major approved)	3

MATH 2020 (QI) Introduction to Logic and Geometry (Prereq: MATH 1050; or ACT of 25 or higher)	3
MUSC 3260 Elementary School Music	2
COMD 3910 Sign Language II	4

Junior Year (34 credits)

Fall Semester (18 credits)

STAT 1040 (QL) Introduction to Statistics	3
COMD 2500 Language, Speech, and Hearing Development	3
PEP 3050 Physical Education in the Elementary School	3
COMD 5610 Introduction to Education of the Deaf and Hard of Hearing	3
Depth Humanities and Creative Arts (DHA) Course	3
Depth Life and Physical Sciences (DSC) Course	3

Spring Semester (16 credits)

COMD 3080 American Sign Language Practicum	1
Level III in Elementary Education:	
ELED 4000 Teaching Science and Practicum Level III	3
ELED 4030 (CI) Teaching Language Arts and Practicum Level III	3
ELED 4040 (CI) Teaching Reading II and Practicum Level III	3
ELED 4050 Teaching Social Studies and Practicum Level III	3
ELED 4060 Teaching Mathematics and Practicum Level III	3

Senior Year (32 credits)

Fall Semester (16 credits)

COMD 4750 Teaching the English Language to Individuals who are Deaf and Hard of Hearing	3
COMD 4770 Audiology and Teachers of Children who are Deaf and Hard of Hearing	3
COMD 4780 Socio-Cultural Aspects of Deafness	3
COMD 4910 (CI) Sign Language III	4
COMD 5740 Teaching Reading to Deaf and Hard of Hearing Children	3

Spring Semester (16 credits)

COMD 4630 Teaching Speech to Deaf and Hard of Hearing Children	3
COMD 4790 Psychological Principles and Individuals who are Deaf and Hard of Hearing	3
COMD 4920 Sign Language IV	4
COMD 5600 Classroom Teaching Using American Sign Language	3
COMD 5620 Teaching School Subjects to Students who are Deaf and Hard of Hearing	3

The undergraduate major for communicative disorders and deaf education consists of 44 semester credits of courses specified by the department, plus 4-8 semester credits of extra departmental coursework. Current national board and state educational agency licensure requirements demand more coursework than the minimum numbers required for University graduation. Students desiring supportive courses for majors in special education, elementary or secondary education, family life, psychology, or other related departments are advised to seek counsel from the departmental advisor in determining an effective minor core.

Education of the Deaf and Hard of Hearing

Students wishing to obtain licensure to teach the deaf and hard of hearing will need to complete the majority of the requirements for a teaching license in early childhood education, elementary education, secondary education, or special education. For students in the Composite Deaf Education/Elementary Education major, these requirements are fulfilled within the program.

Department of Communicative Disorders and Deaf Education

Course Requirements

Each student in audiology and speech-language pathology must complete a component of professional training, which includes departmental and extra-departmental coursework. This professional training component includes the following courses:

A. Lower-division Core Courses (12-13 credits)

MATH 1010 Intermediate Algebra (F,Sp,Su).....	3
MATH 1050 (QL) College Algebra (F,Sp,Su) (4 cr) or	
STAT 1040 (QL) Introduction to Statistics (F,Sp,Su) (3 cr).....	3-4
CS 1010 (BPS) Foundations of Computer Science (F,Sp,Su) (3 cr) or	
BIS 1400 Microcomputer Applications in Business (F,Sp,Su) (3 cr).....	3
PSY 1010 (BSS) General Psychology (F,Sp,Su).....	3

B. Extra-departmental Core Courses (14 credits)

BIOL 1010 (BLS) Biology and the Citizen (F,Sp,Su).....	3
BIOL 2000 Human Physiology (F,Sp,Su) (4 cr) or	
BIOL 2010 Human Anatomy (Sp,Su) (4 cr).....	4
PSY 1400 Analysis of Behavior: Basic Principles (F,Sp,Su).....	3
PSY 1410 Analysis of Behavior: Basic Principles Lab (F,Sp,Su).....	1
SPCH 2600 (CI) Interpersonal Communication (F,Sp).....	3

C. Course Required for State Licensure (2 credits)

SPED 4000 Education of Exceptional Individuals (F,Sp,Su).....	2
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D. Communicative Disorders Major Core Requirements (41-42 credits)

COMD 2400 Orientation and Observation (F,Sp).....	1
COMD 2500 Language, Speech, and Hearing Development (F,Sp).....	3
COMD 2910 (CI) Sign Language I (Majors) (F,Sp,Su).....	4
COMD 3100 Fundamentals of Anatomy for Speech and Language (F).....	3
COMD 3120 Disorders of Articulation and Phonology (Sp).....	3
COMD 3400 Acoustics and Anatomy of the Ear (F).....	3
COMD 3500 Phonetics/Developmental Phonology (F).....	3
COMD 3650 Clinical Processes and Behavior (Sp).....	2
COMD 3700 Basic Audiology (F).....	3
COMD 4400 Clinical Practicum in Audiology (F,Sp,Su).....	1-2
COMD 5010 School-Based Practices (Sp).....	2
COMD 5070 Speech Science (F).....	3
COMD 5100 Language Science (Sp).....	3
COMD 5200 Language Assessment and Intervention for Preschool Children (Sp).....	4
COMD 5330 Aural Rehabilitation (Sp).....	3

E. Upper-division Electives, Preapproved by Department (12 credits)

Departmental Honors

Students who would like to experience greater academic depth within their major are encouraged to enroll in departmental honors. Through original, independent work, Honors students enjoy the benefits of close supervision and mentoring, as they work one-on-one with faculty in select upper-division departmental courses. Honors students also complete a senior project, which provides another opportunity to collaborate with faculty on a problem that is significant, both personally and in the student's discipline. Participating in departmental honors enhances students' chances for obtaining fellowships and admission to graduate school. Minimum GPA requirements for participation in departmental honors vary by department, but usually fall within the range of 3.30-3.50. Students may enter the Honors Program at almost any stage in their academic career, including at the junior (and sometimes senior) level. The campus-wide Honors Program, which is

open to all qualified students regardless of major, offers a rich array of cultural and social activities, special classes, and the benefit of Honors early registration. Interested students should contact the Honors Program, Merrill Library 374, (435) 797-2715, honors@cc.usu.edu. Additional information can be found online at: <http://www.usu.edu/honors/>

Additional Information

For more information concerning graduation requirements and course sequencing, see the major requirement sheet, available from the Department of Communicative Disorders and Deaf Education, or online at: <http://www.usu.edu/ats/majorsheets/>. Additional information may also be found at the departmental website: <http://www.coe.usu.edu/comd>

Because many of the undergraduate COMD-DE courses are taught in sequence, students should meet with a departmental advisor prior to beginning classes in the COMD-DE major to assure that the most efficient and effective schedule is followed. Students should also confer with a departmental advisor for information about changes in requirements or scheduling.

Graduate Programs

Admission Requirements

A bachelor's degree in Communicative Disorders or equivalent requirements must be completed before the student enters the graduate program. The time required to complete the master of science degree is determined during the first semester of study by a temporary department committee consisting of professors from the student's direct field of study.

Students seeking the MEd with a specialization in education of the deaf and hard of hearing must have an undergraduate degree in early childhood, elementary, secondary, or special education. Students coming into the master's degree with a degree other than deaf education will need to plan on a two-year MEd program, while those coming directly through the USU curriculum will need to plan on a one-year master's degree program.

In addition to School of Graduate Studies admission requirements, students must demonstrate competency in American Sign Language, in order to be admitted to the education of the deaf and hard of hearing program.

Applications will be considered once a year between March 1 and March 15. However, students must have completed the application process to the School of Graduate Studies by February 15. No application will be considered until all the required information is submitted to the School of Graduate Studies.

Doctorate of Audiology

The Department of Communicative Disorders and Deaf Education at Utah State University offers a clinical Doctorate of Audiology (AuD). The program provides students with a broad yet in-depth academic and practicum-based curriculum to prepare them for applied audiology in a variety of settings. Graduates will be skilled to function at a high level of expertise in such environments as clinics, hospitals, private practice, research laboratories, hearing conservation programs, schools, the military, etc.

Department of Communicative Disorders and Deaf Education

The program is a four-year post-baccalaureate residency program, the first of its kind in the Intermountain West and Pacific states. Utah State University is the birthplace of educational audiology. In addition, USU is in the forefront of research in telehealth applications in audiology. The AuD will enable graduates to enter the field at a professional level and begin a rewarding career of service in this evolving allied healthcare discipline.

Master's Degrees

Generally, all students will complete the requirements as specified below. In some instances students will have had some of the coursework required in the graduate curriculum as part of the undergraduate training at another institution. In those cases, the program will be individualized to meet national licensure through the American Speech-Language-Hearing Association (ASHA) and state educational licensure from the State of Utah. In no instance will students amass fewer than 36 graduate credits.

At the end of their programs, all graduate students, except for those in education of the deaf and hard of hearing, must take the NTE examination in their area of specialty. This must be done before a letter of completion will be sent to the School of Graduate Studies. Students are required to list USU as a recipient of NTE test scores.

Speech-Language Pathology

The program in speech-language pathology is accredited by the Council on Academic Accreditation of the American Speech-Language-Hearing Association (ASHA). The Utah State Office of Education has also approved the program. Students completing the master's curriculum are eligible for licensure from ASHA and the State of Utah Board of Education and additionally have met the academic and practicum requirements for licensure from the State of Utah. As a consequence of preparation and licensure, students are prepared for employment in any setting where the services of a qualified provider of speech and language services are provided.

Education of the Deaf and Hard of Hearing

The program in Education of the Deaf and Hard of Hearing is accredited by the Council on Education of the Deaf (CED) and is also approved by the Utah State Office of Education. Students completing this program may be licensed by the Utah State Board of Education as teachers of the deaf and hard of hearing and they also meet the requirements for licensure by CED. Students who complete the curriculum are prepared to provide services as teachers of the deaf and hard of hearing in any setting in which such services are furnished.

The following courses or their equivalent are required for all students seeking the MEd in education of the deaf and hard of hearing:

COMD 2500 Language, Speech, and Hearing Development (F,Sp).....	3
COMD 2910 (CI) Sign Language I (Majors) (F,Sp,Su)	4
COMD 3050 Practicum and Methods in Teaching Children who are Deaf and Hard of Hearing (F,Sp).....	1-3
COMD 3080 American Sign Language Practicum (F,Sp).....	1
COMD 3910 Sign Language II (F,Sp,Su)	4
COMD 4630 Teaching Speech to Deaf and Hard of Hearing Children (Sp)	3
COMD 4750 Teaching the English Language to Individuals who are Deaf and Hard of Hearing (F).....	3
COMD 4760 Early Intervention for Children who are Deaf and Hard of Hearing (F)	3
COMD 4770 Audiology and Teachers of Children who are Deaf and Hard of Hearing (F)	3
COMD 4780 Socio-Cultural Aspects of Deafness (F)	3

COMD 4790 Psychological Principles and Individuals who are Deaf and Hard of Hearing (Sp)	3
COMD 4910 (CI) Sign Language III (F,Sp).....	4
COMD 4920 Sign Language IV (Sp)	4
COMD 5610 Introduction to Education of the Deaf and Hard of Hearing (F)	3
COMD 5620 Teaching School Subjects to Students who are Deaf and Hard of Hearing (Sp).....	3
COMD 6430 Speech Communication and Hearing Loss (F)	3
COMD 6640 Strategies for Teaching Children who are Deaf and Hard of Hearing (F)	3
COMD 6650 Strategies for Teaching English Language to Children who are Deaf and Hard of Hearing (F)	3
COMD 6700 Practicum in Education of Children who are Deaf and Hard of Hearing (F,Sp,Su)	1-3
COMD 6800 Student Teaching—Day-School Program (F)	6-12
COMD 6820 Principles of Intervention for Children who are Deaf and Hard of Hearing (Sp)	3
COMD 6830 Student Teaching—Residential (Sp).....	6-12
COMD 6850 Seminar in Communicative Disorders and Deaf Education (F,Sp,Su)	1-3

Educational Specialist Degree

The department offers an Educational Specialist (EdS) program that can be individualized to suit a candidate's need within a basic structure of educational audiology and with foci on research, supervision, and evaluation. The program is designed for those individuals who have completed the master's degree and who are practicing in educational settings. The degree requires a minimum of 30 credits beyond the master's degree and may be completed in part through coursework in the summer and extension study and research in conjunction with the individual's workplace.

Course Requirements

Graduate Courses in Speech-Language Pathology

Year One:

Fall Semester

COMD 6020 Language Assessment and Intervention for School-age Children and Adolescents.....	3
COMD 6030 Disorders of Fluency—Stuttering	3
COMD 6040 Communication Disorders Related to Orofacial Anomalies.....	3
COMD 6050 Professional Practice in Speech-Language Pathology	2
COMD 6100 Advanced Clinical Practicum in Speech-Language Pathology	1-3
COMD 6130 Neuropathologies of Speech and Language	4

Spring Semester

COMD 6040 Communication Disorders Related to Orofacial Anomalies.....	3
COMD 6100 Advanced Clinical Practicum in Speech-Language Pathology	1-3
COMD 6140 Pediatric Neurogenic Disorders.....	3
COMD 6220 Severe Communication Impairments	3
COMD 6810 Disorders of Phonation	3

Summer Semester

COMD 6370 Educational Audiology	3
EDUC 6550 Research for Classroom Teachers (3 cr) or	
EDUC 6570 Introduction to Educational Psychological Research (3 cr)	3

Department of Communicative Disorders and Deaf Education

Year Two:

Fall Semester

COMD 6050 Professional Practice in Speech-Language Pathology	2
COMD 6120 Adult Disorders of Motor Speech and Swallowing	4
COMD 6200 Internship in Public Schools—Speech-Language Pathology	1-4
COMD 6210 Bilingual/Bicultural Services	2

Spring Semester

COMD 6300 Externship in Speech-Language Pathology	1-6
COMD 6970 Thesis	1-7

Graduate Courses in Audiology

Year One:

Fall Semester

COMD 7200 Introduction to Clinical Practice	2
COMD 7310 Psychoacoustics and Instrumentation	3
COMD 7380 Advanced Audiology	2
COMD 7390 Medical Aspects of Audiology: Pediatrics	3
COMD 7820 Research Seminar in Audiology	1

Spring Semester

COMD 5330 Aural Rehabilitation (3 cr) or	
EDUC 6570 Introduction to Educational and Psychological Research (3 cr)	3
COMD 7200 Introduction to Clinical Practice	2
COMD 7320 Amplification I	3
COMD 7340 Pediatric Audiology	3
COMD 7490 Medical Aspects of Audiology: Adult	3

Summer Semester

EDUC 6570 Introduction to Educational and Psychological Research	3
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Year Two:

Fall Semester

COMD 7300 Intermediate Clinical Practicum	2
COMD 7420 Amplification II	3
COMD 7430 Electrophysiology	3
EDUC 6600 Measurement, Design, and Analysis I	3

Spring Semester

COMD 6370 Educational Audiology	3
COMD 7300 Intermediate Clinical Practicum	2
COMD 7460 Adult Aural Rehabilitation	3
COMD 7530 Balance Evaluation and Management	3
COMD 7820 Research Seminar in Audiology	1

Summer Semester (Optional)

COMD 7300 Intermediate Clinical Practicum	2
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Graduate Courses in Education of the Deaf and Hard of Hearing

Students entering the program in Education of the Deaf and Hard of Hearing may choose one of three tracks. **Track 1** is followed by students who have obtained their bachelor's degree in Deaf Education/Elementary Education. **Track 2** is followed by students coming into the program without the required background in Deaf Education, but who have received a bachelor's degree in Elementary Education, Secondary Education, or Special Education. **Track 3** follows the program outlined for those students who do not want a teaching license, but who wish to work with families of deaf children in an early intervention program. This track provides students with an early intervention endorsement, for serving families who have deaf children, ages birth to three years.

Track 1 (one-year program)

For students who have obtained their bachelor's degree in Deaf Education/Elementary Education.

Fall Semester (18 credits)

COMD 6640 Strategies for Teaching Children who are Deaf and Hard of Hearing	3
COMD 6650 Strategies for Teaching English Language to Children who are Deaf and Hard of Hearing	3
COMD 6800 Student Teaching—Day-School Program (8 weeks at the Utah School for the Deaf)	10
COMD 6850 Seminar: Education of Children who are Deaf and Hard of Hearing	2

Spring Semester (18 credits)

COMD 6820 Principles of Intervention for Children who are Deaf and Hard of Hearing	3
COMD 6830 Student Teaching—Residential (6 weeks at one level and 6 weeks at a different level)	12
COMD 6850 Seminar in Communicative Disorders and Deaf Education	3

Track 2 (two-year program)

For students coming into the program without the required background in Deaf Education, but who have received a bachelor's degree in Elementary Education, Secondary Education, or Special Education.

Year One:

Fall Semester (19 credits)

COMD 5610 Introduction to Education of the Deaf and Hard of Hearing	3
COMD 6740 Teaching Reading to Deaf and Hard of Hearing Children	3
COMD 6750 Teaching the English Language to Individuals who are Deaf and Hard of Hearing	3
COMD 6770 Audiology and Teachers of Children who are Deaf and Hard of Hearing	3
COMD 6780 Socio-Cultural Aspects of Deafness	3
COMD 6910 Sign Language III	4

Spring Semester (19 credits)

COMD 2500 Language, Speech, and Hearing Development (must be taken sometime)	3
COMD 5600 Classroom Teaching Using American Sign Language	3
COMD 5620 Teaching School Subjects to Students who are Deaf and Hard of Hearing	3
COMD 6630 Teaching Speech to Deaf and Hard of Hearing Children	3
COMD 6790 Psychological Principles and Individuals who are Deaf and Hard of Hearing	3
COMD 6920 Sign Language IV	4

Year Two:

Fall Semester (14 credits)

COMD 6640 Strategies for Teaching Children who are Deaf and Hard of Hearing	3
COMD 6650 Strategies for Teaching English Language to Children who are Deaf and Hard of Hearing	3
COMD 6800 Student Teaching—Day-School Program (8 weeks at the Utah School for the Deaf)	8

Spring Semester (15 credits)

COMD 6830 Student Teaching—Residential	12
COMD 6850 Seminar in Communicative Disorders and Deaf Education	3

Department of Communicative Disorders and Deaf Education

Track 3

Early Childhood Focus (one-year program)

This early intervention program is for students wishing to work with families who have deaf children who are between birth and 3 years of age. Students must have completed the necessary background in Early Childhood and Family, Consumer, and Human Development.

Fall Semester (16 credits)

COMD 3910 Sign Language II	4
COMD 5610 Introduction to Education of the Deaf and Hard of Hearing	3
COMD 6760 Early Intervention for Children who are Deaf and Hard of Hearing	3
COMD 6770 Audiology and Teachers of Children who are Deaf and Hard of Hearing (3 cr) or	
COMD 7340 Pediatric Audiology (instructor's permission required) (3 cr)	3
COMD 6780 Socio-Cultural Aspects of Deafness	3

Spring Semester (15 credits)

COMD 4910 (CI) Sign Language III	4
COMD 6630 Teaching Speech to Deaf and Hard of Hearing Children	3
COMD 6960 Master's Project	2
SPED 5060 Consulting with Parents and Teachers (instructor's permission required)	3
SPED 5730 Intervention Strategies for Young Children with Disabilities (instructor's permission required)	3

Summer Semester (8 credits)

COMD 6700 Practicum in Education of Children who are Deaf and Hard of Hearing	3
COMD 6960 Master's Project	2
SPED 5710 Young Children with Disabilities: Characteristics and Services (taught online; register through Extension)	3

In order to earn the MEd from the Education of the Deaf and Hard of Hearing program, the student must (a) pass a sign language competency examination, (b) complete a creative project, or (c) pass a comprehensive written and oral examination. The candidate must also demonstrate the ability to teach children who are deaf and/or hard of hearing in a variety of settings.

Clinical Doctorate Program in Audiology

The Doctorate of Audiology (AuD) program at Utah State University meets the mandate of the American Speech-Language-Hearing Association (ASHA) to have audiology students move from master's-level to doctoral-level training as the entry-level requirement within the profession of audiology. Specifically, the AuD requires one year of coursework, one year of intensive clinical practicum, and a doctoral-level clinically-related project to meet the requirements currently recommended for the AuD by ASHA and the American Academy of Audiology (AAA). Students at USU will participate in didactic and experiential learning in clinical, educational, telehealth, and rehabilitative audiology.

Course Requirements

A. Required Courses

All requirements for the undergraduate major in Communicative Disorders and Deaf Education must be taken in addition to the following graduate courses:

COMD 6370 Educational Audiology (F)	3
COMD 6780 Socio-Cultural Aspects of Deafness (F)	3
COMD 7200 ¹ Introduction to Clinical Practice (F,Sp,Su)	4
COMD 7300 ¹ Intermediate Clinical Practicum (F,Sp,Su)	4
COMD 7310 Psychoacoustics and Instrumentation (F)	3
COMD 7320 Amplification I (Sp)	3
COMD 7340 Pediatric Audiology (Sp)	3
COMD 7380 Advanced Audiology (F)	2
COMD 7390 Medical Aspects of Audiology: Pediatrics (F)	3
COMD 7400 Advanced Clinical Practicum (F,Sp,Su)	2
COMD 7410 Noise and Hearing Conservation (F)	3
COMD 7420 Amplification II (F)	3
COMD 7430 Electrophysiology (F)	3
COMD 7460 Adult Aural Rehabilitation (Sp)	3
COMD 7470 Educational Audiological Management (F)	3
COMD 7490 Medical Aspects of Audiology: Adult (Sp)	3
COMD 7530 Balance Evaluation and Management (Sp)	3
COMD 7800 ¹ Clinical Externship in Audiology (F,Sp,Su)	12
COMD 7820 ¹ Research Seminar in Audiology (F)	4
COMD 7850 ¹ Externship Seminar (F,Sp,Su)	6
COMD 7860 Practice Management in Audiology (Sp)	3
COMD 7870 ¹ Audiology Capstone Project (F,Sp,Su)	12
EDUC 6570 Introduction to Educational and Psychological Research (F,Sp,Su)	3
EDUC 6600 Measurement, Design, and Analysis I (F,Sp,Su)	3

B. Elective Courses

COMD 6680 SKI*HI Training (F,Sp,Su)	1-3
SPED 6500 Interdisciplinary Workshop (F,Sp,Su)	1-3

¹In order to earn the required number of credits, students must take this course, which is repeatable for credit, during more than one semester.

Research Requirements

Several options are available for graduate students to complete the research or special project required for the MS or MEd. These options are specified in the list of requirements available in the department office, and include for the MS the traditional Plan A experimental thesis option, as well as the Plan B integrative review option or creative project option. Declaration of an option must be made at the time the student files an Application for Candidacy form with the School of Graduate Studies. Changes in the option will necessitate a complete revision and review of the Application for Candidacy by the student's supervisory committee.

Licensure

Each undergraduate and graduate is advised on which classes will meet Utah State Office of Education and American Speech-Language-Hearing Association licensure requirements, as well as Utah State Professional Licensure requirements. State Office of Education licensure credentials within Utah include approval for audiology, speech-language pathology, and education of the deaf and hard of hearing. Graduation from any of these programs ensures the student may be licensed in Utah. Such licensure facilitates meeting other requirements for other states because of reciprocal agreements that exist among some state educational agencies throughout the country.

Practicum Opportunities

Practicum experience at the graduate level is available in a variety of settings. The department maintains a Speech-Language-Hearing Center offering a full range of diagnostic and remedial services to individuals with speech-language or hearing disabilities. Additionally, students are assigned to off-campus practicum sites such as hospitals,

Department of Communicative Disorders and Deaf Education

schools for the deaf, long-term and rehabilitation care centers, clinics, physician's offices, and public schools. Placement in out-of-state practicum sites is available for those students who request it. Students may also be placed at the Center for Persons with Disabilities for experience in birth to age three services. **Students must be enrolled in clinical practicum each semester of their graduate program.**

Financial Assistance

Limited departmental and federal grant support is available to graduate students and is awarded on a competitive basis. The application form for financial support must be submitted to the department no later than March 1 for consideration for the coming year.

Career Opportunities

Audiology graduates are prepared to work as clinical, educational, and rehabilitative audiologists. Speech-Language-Pathology graduates are prepared to work in a variety of medical and school settings. Graduates in the area of Education of the Deaf are trained to work in total communication, bilingual/bicultural, and auditory-aural settings.

Additional Information

Specific details about each of the foregoing degree programs are outlined in policy and procedure documents available through the department. All requirements are subject to change; check with the department for current requirements. Additional information may be obtained by contacting the Department of Communicative Disorders and Deaf Education.

Communicative Disorders and Deaf Education Faculty

Trustee Professor

Carol J. Strong, Interim Dean, College of Education and Human Services; language development, language assessment and intervention, language disorders in school-age students, research methodology in communicative disorders, narrative assessment and literature-based language intervention

Professors

James C. Blair, educational audiology, education of the deaf and hard of hearing
J. Freeman King, American Sign Language, linguistics, teacher preparation

Adjunct Clinical Professors

Bryan R. Larsen, MD, gastroenterologist
Gordon S. Wood, MD, otolaryngologist

Associate Professors

Kim Corbin-Lewis, diagnosis and management of voice disorders, laryngeal imaging, disorders of motor speech, dysphagia, anatomy and physiology of speech and swallow
Beth E. Foley, neuropathologies of speech and language, augmentative/alternative communication, language and literacy
Sonia S. Manuel-Dupont, nondiscriminatory educational assessment of non-English-language background children, Native American language assessment, emergent literacy, ethnic literacy, developmental phonology, syntax, professional and scientific discourse analysis
John E. Ribera, medical audiology, amplification, hearing science, telemedicine
Carmel Yarger, American Sign Language, curriculum for students who are deaf and hard of hearing, deaf education

Adjunct Associate Professor

Douglas W. Laws, clinical audiology

Assistant Professors

Mark Krumm, pediatric audiology, telemedicine, aural rehabilitation
Jaclyn Littledike, orofacial anomalies, professional practice issues, and clinical supervision
Vicki Simonsmeier, pediatric neurogenic disorders, oral-motor dysphagia, early intervention programs, audiology, auditory processing, clinical supervision
Susan Watkins, early intervention programs, sensory impaired infants and toddlers

Clinical Instructors

Chad Bingham, pediatric brain injury, limited English proficiency, augmentative/assistive technology, clinical supervision
Dee R. Child, disorders of phonation, articulation, fluency
Anne Elsweller, fluency, preschool language and articulation, clinical supervision
Karen Filimoehala, language
Kathryn S. Gantz, speech-language pathology
Jan Kelley-King, American Sign Language, deaf education
Elizabeth Parker, education of the deaf and hard of hearing
Heather Jo Jensen, clinical supervision, amplification, medical audiology

Course Descriptions

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Department of Computer Science

Department Head: Donald H. Cooley

Location: Main 414

Phone: (435) 797-2451

FAX: (435) 797-3265

E-mail: usucs@cs.usu.edu

WWW: <http://www.cs.usu.edu/>

Associate Head and Coordinator for Graduate Programs in Computer Science:

Gregory W. Jones, Main 420, (435) 797-3267, greg.jones@usu.edu

Undergraduate Advisor:

Myra Cook, Main 424, (435) 797-8019, myra.cook@usu.edu

Degrees offered: Bachelor of Science (BS), Bachelor of Arts (BA), Master of Science (MS), and Doctor of Philosophy (PhD) in Computer Science; Master of Computer Science (MCS)

Undergraduate emphases: BS, BA—Science, Digital Systems, Information Systems, Bioinformatics, Information Technology

Graduate specializations: MS—Artificial Intelligence, Parallel Systems, Software Engineering

Accreditation: The Computer Science undergraduate program is accredited by the Computing Accreditation Commission of ABET, 111 Market Place, Suite 1050, Baltimore, MD 21202-4012; telephone (410) 347-7700.

Undergraduate Programs

Objectives

The core objective of the department is to fulfill its mission, as defined in its mission statement. A detailed description of all department objectives is given under the department's website:

<http://www.cs.usu.edu/>. The outcome objectives for undergraduates are as follows:

Learning Objectives: Undergraduate Outcomes

All students graduating with a Bachelor of Science in Computer Science from Utah State University will be expected to show mastery as follows:

1. Graduates will be proficient in programming in at least two programming languages which have significance in industry.
2. Graduates will master the core curriculum in:
 - a. Data Structures and Algorithms
 - b. Computer Architecture and Organization
 - c. Programming Languages
 - d. Operating Systems
 - e. Software Engineering
3. Graduates will understand the practices and dynamics required to develop software, whether it be a single program or a major software product developed in a team environment.
4. Graduates will gain proficiency in the use of mathematical tools, including calculus, elementary statistics, and probability.
5. Graduates will have sufficient mastery of fundamental knowledge to be lifelong learners in computer science.

6. Graduates will understand the social and ethical issues which face computer scientists, and thus be able to contribute in a positive and productive manner to society.
7. Graduates will be able to communicate information effectively, both in writing and orally.

The course of study offered by the Department of Computer Science is directed primarily toward developing the problem solving skills of its students. This, in conjunction with the understanding of computers and computer systems provided by coursework, will enable a graduate of the program to apply his or her knowledge to finding solutions to problems that arise in the science, business, industry, government, and education sectors.

Students who have the ability to think analytically and creatively will find a challenging and exciting future in computer science.

Opportunities for practical applications of computer science skills are available with members of the computer science faculty who are engaged in research and consultation work both on and off campus.

Assessment

The Computer Science Department has an ongoing assessment process that it highly values. Faculty members devote much of their time and resources to frequent assessment of the level or degree to which stated objectives are being met, the objectives themselves, and the departmental mission statement. The department then uses these results to establish priorities and guide the program. For further information, go to <http://www.cs.usu.edu/>, and click on **assessment**.

Computer Science

Computer Science deals with information structures and processes as they are represented and implemented in modern high-speed digital computers, and with information processing systems designed to implement useful applications of computing.

The program in computer science attempts to provide a solid foundation of knowledge about computers and to teach a mode of thinking which will permit continuing growth on the part of graduates. Prospective students should have an aptitude for mathematics and logic and an interest in analysis and deduction.

Computer science is one of the fastest growing fields of study in our society. Excellent employment opportunities are available to computer science graduates. All of the major corporations hire computer science graduates. Graduates in Computer Science work for numerous Utah-based corporations, as well as Microsoft, IBM, Hewlett-Packard, etc.

The Computer Science bachelor's degree is a four-year degree with areas of emphasis in Science, Digital Systems, Information Systems, Bioinformatics, and Information Technology. In addition, by working with a departmental advisor, students may develop a plan of study tailored to their own unique career objectives.

Science Emphasis

The Science Emphasis is designed for those who plan to pursue scientific or technical careers, research, or graduate education in computer science. Students choosing the science emphasis will take courses in programming languages, advanced algorithms, and math courses in calculus, linear analysis, and multi-variable calculus. Additional courses include a variety of upper-division computer science courses, chosen in consultation with an advisor.

Department of Computer Science

Digital Systems Emphasis

The Digital Systems Emphasis is available for those interested in both the hardware and software aspects of computer systems. In addition to computer science and mathematics courses, students in this emphasis will take electrical engineering courses in electronics, circuits, digital fundamentals, microcomputer systems, and digital system design. The curriculum for students in this emphasis is similar to that for students in the computer engineering major in the Electrical and Computer Engineering Department.

Information Systems Emphasis

The Information Systems program at Utah State University offers a common core of courses through two department majors: (1) **Computer Science** and (2) **Business Information Systems**. The curricula of the individual departments differ substantially in emphasis.

The Computer Science major with an Information

Systems emphasis is designed for students interested in a career as a Computer Scientist with a background in Information Sciences and Systems. Majors in this emphasis are trained in all phases of the analysis, design, and implementation of information systems. They also gain an understanding of business fundamentals. Thus, students are prepared to apply their computing expertise in a business environment. This program of study, offered within the College of Science, leads to a Bachelor of Science, Bachelor of Arts, or Master of Science degree in Computer Science.

The Business Information Systems major, Management Information Systems emphasis, is offered in the Business Information Systems Department, College of Business (see pages 181-182). The Bachelor of Science or Bachelor of Arts program is designed for students interested in business careers as information specialists, systems analysts, network managers, application programmers, and information systems managers in business and industry. BIS majors take required courses in analysis and design, Internet management, telecommunications, decision support systems, spreadsheet and database applications, and information systems projects. All graduates are required to complete a common core of business subjects. The College of Business is accredited by the American Assembly of Collegiate Schools of Business. The department also offers a Master of Science in Business Information Systems with a specialization in Management Information Systems. See page 185 for additional details.

Bioinformatics Emphasis

The Bioinformatics Emphasis is designed for students who wish to pursue careers in the computer science aspects of bioinformatics. Students in this emphasis gain a strong background in core computer science areas, such as programming, theory of computing, and software development. In addition, they follow a course of study in biology, chemistry, and statistics. Through this background and course of study, students are provided with the computational skills and the scientific understanding necessary for work in bioinformatics.

Information Technology Emphasis

The Information Technology Emphasis trains students in all phases of analysis, design, and implementation of information technology. It also gives students expertise in the theory and application of information technology. At the same time, this emphasis provides students with a strong background in business principles, including accounting, finance, marketing, and human resource management. Students in the Information Technology emphasis are prepared for careers that straddle information technology and business, in both the private and public sectors.

Undergraduate Research

The Computer Science Department provides opportunities for undergraduates to participate in research projects. Additionally, a student may register for CS 4950 (Undergraduate Research, 1-4 credits) to receive credit for their research. To learn about research opportunities, students should contact Computer Science faculty members. Students may work on a project of their own under faculty supervision, or they may do research as part of a faculty member's research team. For further information, contact Dan Watson, the department's coordinator of undergraduate research, at (435) 797-2440 or watson@cs.usu.edu.

Department and General College of Science Requirements

To fulfill the University Studies requirements, majors in computer science must complete a total of at least 30 semester credits in writing, languages, humanities, arts, and/or social sciences. Courses taken to meet the University Studies requirements, if applicable, may also be counted to meet this departmental requirement. Students must work closely with their advisor to meet both these requirements.

Bachelor of Science Core Requirements

Students working toward the Bachelor of Science degree in Computer Science must complete the following:

1. One year of calculus, including MATH 1210 and 1220. *Students in the Information Technology Emphasis must substitute MATH 1100.*
2. MATH 3310 (Discrete Mathematics). *Not required for students in the Information Technology Emphasis.*
3. One of the following year-long science sequences: (1) BIOL 1210, 1220 (required for Bioinformatics Emphasis); (2) CHEM 1210, 1220, 1230, 1240; (3) PHYX 2210, 2220 (required for Digital Systems Emphasis); (4) PHYX 2110, 2120 (available for Information Technology Emphasis only); or (5) GEOL 1150, 3200. The sequence chosen must be outside the student's department.

Except for students enrolled in the Information Technology Emphasis, all Computer Science majors must complete at least 12 science credits.

Requirements

Summary of Departmental Admission and Retention Requirements

Admission requirements of the Department of Computer Science for freshmen are the same as those described for the University on pages 16-19. Transfer students with a 2.5 GPA may apply for admission to the department.

Before a student can register for a Computer Science course, he or she must earn a grade of C- or better in all prerequisite courses. All required classes for the major must be completed with a grade of C- or better. Required courses, regardless of department, may not be taken pass-fail, and a Computer Science major must have advanced standing or written permission to register for Computer Science courses or Electrical and Computer Engineering courses at the 3000-level or above.

Department of Computer Science

Courses Required for Advanced Standing

Students must achieve a minimum cumulative GPA of 2.5 and a grade of C- or better in one of the following core emphasis course sequences, or their equivalent, as determined by the Computer Science Department:

Science Emphasis

CS 1700 Introduction to Computer Science—CS 1 (F,Sp,Su)	3
CS 1710 Introduction to Computer Science—CS 1 Lab (F,Sp,Su)	1
CS 1720 (QI) Introduction to Computer Science—CS 2 (F,Sp,Su)	3
CS 2200 (QI) Algorithms and Data Structures—CS 3 (F,Sp,Su)	3
CS 2370 (CI) Software Engineering (F,Sp)	3
CS 2550 Computer Organization (F,Sp)	3
CS 3000 Undergraduate Seminar (F,Sp)	1
MATH 1210 (QL) Calculus I (F,Sp,Su)	4
MATH 1220 (QL) Calculus II (F,Sp,Su)	4
MATH 3310 Discrete Mathematics (F,Sp,Su)	3

Digital Systems Emphasis

CS 1700 Introduction to Computer Science—CS 1 (F,Sp,Su)	3
CS 1710 Introduction to Computer Science—CS 1 Lab (F,Sp,Su)	1
CS 1720 (QI) Introduction to Computer Science—CS 2 (F,Sp,Su)	3
CS 2200 (QI) Algorithms and Data Structures—CS 3 (F,Sp,Su)	3
CS 2370 (CI) Software Engineering (F,Sp)	3
CS 3000 Undergraduate Seminar (F,Sp)	1
ECE 2530 Digital Circuits (F,Sp)	4
MATH 1210 (QL) Calculus I (F,Sp,Su)	4
MATH 1220 (QL) Calculus II (F,Sp,Su)	4
MATH 3310 Discrete Mathematics (F,Sp,Su)	3

Information Systems Emphasis

CS 1700 Introduction to Computer Science—CS 1 (F,Sp,Su)	3
CS 1710 Introduction to Computer Science—CS 1 Lab (F,Sp,Su)	1
CS 1720 (QI) Introduction to Computer Science—CS 2 (F,Sp,Su)	3
CS 2200 (QI) Algorithms and Data Structures—CS 3 (F,Sp,Su)	3
CS 2370 (CI) Software Engineering (F,Sp)	3
CS 2550 Computer Organization (F,Sp)	3
CS 3000 Undergraduate Seminar (F,Sp)	1
MATH 1210 (QL) Calculus I (F,Sp,Su)	4
MATH 1220 (QL) Calculus II (F,Sp,Su)	4
MATH 3310 Discrete Mathematics (F,Sp,Su)	3

Bioinformatics Emphasis

CS 1700 Introduction to Computer Science—CS 1 (F,Sp,Su)	3
CS 1710 Introduction to Computer Science—CS 1 Lab (F,Sp,Su)	1
CS 1720 (QI) Introduction to Computer Science—CS 2 (F,Sp,Su)	3
CS 2200 (QI) Algorithms and Data Structures—CS 3 (F,Sp,Su)	3
CS 2370 (CI) Software Engineering (F,Sp)	3
CS 2550 Computer Organization (F,Sp)	3
CS 3000 Undergraduate Seminar (F,Sp)	1
MATH 1210 (QL) Calculus I (F,Sp,Su)	4
MATH 1220 (QL) Calculus II (F,Sp,Su)	4
MATH 3310 Discrete Mathematics (F,Sp,Su)	3

Information Technology Emphasis

CS 1010 (BPS) Foundations of Computer Science, and the Application of Computer Science to the Investigation of Physical Systems and Phenomena (F,Sp,Su)	3
CS 1700 Introduction to Computer Science—CS 1 (F,Sp,Su)	3
CS 1710 Introduction to Computer Science—CS 1 Lab (F,Sp,Su)	1
CS 1720 (QI) Introduction to Computer Science—CS 2 (F,Sp,Su)	3
CS 2200 (QI) Algorithms and Data Structures—CS 3 (F,Sp,Su)	3
CS 2370 (CI) Software Engineering (F,Sp)	3
CS 2550 Computer Organization (F,Sp)	3
CS 3000 Undergraduate Seminar (F,Sp)	1
MATH 1100 (QL) Calculus Techniques (F,Sp,Su)	3

For a more complete statement of requirements, please contact the department directly. Requirements may change from time to time.

Bachelor of Science Degree

The department offers a degree program with emphases in Science, Digital Systems, Information Systems, Bioinformatics, and Information Technology. The objectives are to train computer scientists who can relate to science, computer design, or information-based business disciplines. Other areas of emphasis will be considered on an individual basis.

First Semester Schedule (15 credits)

Depending upon emphasis, a new student's first semester schedule is configured from the following:

CS 1700 Introduction to Computer Science—CS 1	3
CS 1710 Introduction to Computer Science—CS 1 Lab	1
MATH 1210 (QL) Calculus I (<i>for Science, IS, DS, or BI Emphasis</i>)	4 cr or
MATH 1100 (QL) Calculus Techniques (<i>for IT Emphasis</i>) (3 cr)	3 or 4
University Studies courses	7-8

COMPUTER SCIENCE REQUIRED COURSES

Science Emphasis

CS 1700 Introduction to Computer Science—CS 1 (F,Sp,Su)	3
CS 1710 Introduction to Computer Science—CS 1 Lab (F,Sp,Su)	1
CS 1720 (QI) Introduction to Computer Science—CS 2 (F,Sp,Su)	3
CS 2200 (QI) Algorithms and Data Structures—CS 3 (F,Sp,Su)	3
CS 2370 (CI) Software Engineering (F,Sp)	3
CS 2550 Computer Organization (F,Sp)	3
CS 3000 Undergraduate Seminar (F,Sp)	1
CS 3100 Operating Systems and Concurrency (F,Sp)	3
CS 4700 Programming Languages (F,Sp)	3
CS 5050 Advanced Algorithms (F,Sp)	3
CS 5070 Computer Science Capstone (F, Sp, Su)	1
MATH 1210 (QL) Calculus I (F,Sp,Su)	4
MATH 1220 (QL) Calculus II (F,Sp,Su)	4
MATH 2210 (QI) Multivariable Calculus (F,Sp,Su)	3
MATH 2250 (QI) Linear Algebra and Differential Equations (F,Sp,Su)	4
MATH 3310 Discrete Mathematics (F,Sp,Su)	3
MATH 4630 Computer Aided Math for Scientists and Engineers (Sp) or	
MATH 5610 Computational Linear Algebra and Solution of Systems of Equations (F) (3 cr)	3
PHIL 2400 (BHU) Ethics (Sp) (3 cr) or	
PHIL 2500 (BHU) Social Ethics (F) (3 cr) or	
PHIL 3520 (DHA) Business Ethics (Sp) (3 cr) or	
PHIL 4530 (DSC) Ethics and Biotechnology (Sp) (3 cr) or	
PHIL 4540 (DHA) Human Values and Information Technology (Sp) (3 cr)	3
SPCH 1050 (CI) Public Speaking (F,Sp)	3
STAT 3000 (QI) Statistics for Scientists (F,Sp) (3 cr) or	
MATH 5710 Introduction to Probability (F,Sp) (3 cr)	3
Advisor-approved computer science classes numbered 5000 or above	13

In addition, students must complete 6 credits at the 3000 level or higher, appropriate to the degree.

Digital Systems Emphasis

CS 1700 Introduction to Computer Science—CS 1 (F,Sp,Su)	3
CS 1710 Introduction to Computer Science—CS 1 Lab (F,Sp,Su)	1
CS 1720 (QI) Introduction to Computer Science—CS 2 (F,Sp,Su)	3
CS 2200 (QI) Algorithms and Data Structures—CS 3 (F,Sp,Su)	3
CS 2370 (CI) Software Engineering (F,Sp)	3
CS 3000 Undergraduate Seminar (F,Sp)	1
CS 3100 Operating Systems and Concurrency (F,Sp)	3

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CS 4700 Programming Languages (F,Sp)	3
CS 5050 Advanced Algorithms (F,Sp)	3
CS 5070 Computer Science Capstone (F, Sp, Su)	1
ECE 2410 Electrical Circuits (F,Sp)	4
ECE 2530 Digital Circuits (F,Sp)	4
ECE 3710 Microcomputer Hardware and Software (F,Sp)	4
ECE 3720 Microcomputer Systems Programming (Sp)	3
MATH 1210 (QL) Calculus I (F,Sp,Su)	4
MATH 1220 (QL) Calculus II (F,Sp,Su)	4
MATH 2250 (QI) Linear Algebra and Differential Equations (F,Sp,Su) ..	4
MATH 3310 Discrete Mathematics (F,Sp,Su)	3
PHIL 2400 (BHU) Ethics (Sp) (3 cr) or	
PHIL 2500 (BHU) Social Ethics (F) (3 cr) or	
PHIL 3520 (DHA) Business Ethics (Sp) (3 cr) or	
PHIL 4530 (DSC) Ethics and Biotechnology (Sp) (3 cr) or	
PHIL 4540 (DHA) Human Values and Information Technology (Sp) (3 cr)	3
SPCH 1050 (CI) Public Speaking (F,Sp)	3
STAT 3000 (QI) Statistics for Scientists (F,Sp)	3
Advisor-approved computer science classes numbered 5000 or above	13
In addition, students must complete 6 credits at the 3000 level or higher, appropriate to the degree.	

Information Systems Emphasis

ACCT 2010 Survey of Accounting I (F,Sp,Su)	3
ACCT 2020 Survey of Accounting II (F,Sp,Su)	3
BA 3080 (QI) Operations Research (F,Sp)	3
CS 1700 Introduction to Computer Science—CS 1 (F,Sp,Su)	1
CS 1710 Introduction to Computer Science—CS 1 Lab (F,Sp,Su)	1
CS 1720 (QI) Introduction to Computer Science—CS 2 (F,Sp,Su)	3
CS 2200 (QI) Algorithms and Data Structures—CS 3 (F,Sp,Su)	3
CS 2370 (CI) Software Engineering (F,Sp)	3
CS 2550 Computer Organization (F, Sp)	3
CS 3000 Undergraduate Seminar (F,Sp)	1
CS 3100 Operating Systems and Concurrency (F,Sp)	3
CS 3550 Computer Architecture (F,Sp)	3
CS 4700 Programming Languages (F,Sp)	3
CS 5050 Advanced Algorithms (F,Sp)	3
CS 5070 Computer Science Capstone (F, Sp, Su)	1
ECON 1500 (BAI) ¹ Introduction to Economic Institutions, History, and Principles (F,Sp)	3
MATH 1210 (QL) Calculus I (F,Sp,Su)	4
MATH 1220 (QL) Calculus II (F,Sp,Su)	4
MATH 3310 Discrete Mathematics (F,Sp,Su)	3
MHR 3110 (DSS) ² Managing Organizations and People (F,Sp)	3
PHIL 2400 (BHU) Ethics (Sp) (3 cr) or	
PHIL 2500 (BHU) Social Ethics (F) (3 cr) or	
PHIL 3520 (DHA) Business Ethics (Sp) (3 cr) or	
PHIL 4530 (DSC) Ethics and Biotechnology (Sp) (3 cr) or	
PHIL 4540 (DHA) Human Values and Information Technology (Sp) (3 cr)	3
SPCH 1050 (CI) Public Speaking (F,Sp)	3
STAT 2300 (QL) Business Statistics (F,Sp,Su)	4
Advisor-approved computer science classes numbered 5000 or above	13

In addition, the IS Emphasis requires CS 5800 and one course selected from the following list. These courses will be counted among the CS 5000 or above elective courses.

CS 5370 Advanced Software Engineering (F)	3
CS 5700 Object-Oriented Software Development (F)	3
CS 5850 Systems Analysis (Sp)	3

¹ ECON 1500 fulfills the University Studies Breadth American Institutions (BAI) requirement.

² MHR 3110 fulfills the University Studies Depth Social Science (DSS) requirement.

Bioinformatics Emphasis

CS 1700 Introduction to Computer Science—CS 1 (F,Sp,Su)	3
CS 1710 Introduction to Computer Science—CS 1 Lab (F,Sp,Su)	1
CS 1720 (QI) Introduction to Computer Science—CS 2 (F,Sp,Su)	3
CS 2200 (QI) Algorithms and Data Structures—CS 3 (F,Sp,Su)	3
CS 2370 (CI) Software Engineering (F,Sp)	3
CS 2550 Computer Organization (F, Sp)	3
CS 3000 Undergraduate Seminar (F,Sp)	1
CS 3100 Operating Systems and Concurrency (F,Sp)	3
CS 3550 Computer Architecture (F,Sp)	3
CS 4700 Programming Languages (F,Sp)	3
CS 5050 Advanced Algorithms (F,Sp)	3
CS 5070 Computer Science Capstone (F, Sp, Su)	1
CS 5620 Computer Science Applications in Bioinformatics I (Sp)	3
CS 5630 Computer Science Applications in Bioinformatics II (F)	3
CS 5800 Introduction to Database Systems (F)	3
STAT 3000 (QI) Statistics for Scientists (F,Sp)	3
MATH 1210 (QL) Calculus I (F,Sp,Su)	4
MATH 1220 (QL) Calculus II (F,Sp,Su)	4
MATH 2250 (QI) Linear Algebra and Differential Equations (F,Sp,Su) (4 cr) or	
MATH 2270 (QI) Linear Algebra (F) (3 cr)	3 or 4
MATH 3310 Discrete Mathematics (F,Sp,Su)	3
BIOL 3100 (CI) Bioethics (Sp)	3
BIOL 3200 (QI) Principles of Genetics (F,Sp,Su)	4
CHEM 1110 (BPS) General Chemistry I (F,Sp) (4 cr) or	
CHEM 1210 Principles of Chemistry (F,Sp) (4 cr)	4
SPCH 1050 (CI) Public Speaking (F,Sp)	3
Statistical Methods in Bioinformatics course (currently being developed)	
Advisor-approved computer science classes numbered 5000 or above	3
Advisor-approved electives	12-13
Students are strongly encouraged to take BIOL 5730 and its prerequisites to fill this elective requirement.	

Information Technology Emphasis

ACCT 2010 Survey of Accounting I (F,Sp,Su)	3
ACCT 2020 Survey of Accounting II (F,Sp,Su)	3
BA 3080 (QI) Operations Research (F,Sp)	3
BA 3400 (QI) Corporate Finance (F,Sp,Su)	3
BA 3500 Fundamentals of Marketing (F,Sp,Su)	3
CS 1010 (BPS) Foundations of Computer Science, and the Application of Computer Science to the Investigation of Physical Systems and Phenomena (F,Sp,Su)	3
CS 1700 Introduction to Computer Science—CS 1 (F,Sp,Su)	3
CS 1710 Introduction to Computer Science—CS 1 Lab (F,Sp,Su)	1
CS 1720 (QI) Introduction to Computer Science—CS 2 (F,Sp,Su)	3
CS 2200 (QI) Algorithms and Data Structures—CS 3 (F,Sp,Su)	3
CS 2370 (CI) Software Engineering (F,Sp)	3
CS 2550 Computer Organization (F, Sp)	3
CS 3000 Undergraduate Seminar (F,Sp)	1
CS 3010 (DSC/CI/QI) Information Acquisition, Analysis, and Presentation (F,Sp,Su)	3
CS 3100 Operating Systems and Concurrency (F,Sp)	3
CS 3550 Computer Architecture (F,Sp)	3
CS 4700 Programming Languages (F,Sp)	3
CS 4720 Computer Networking I (F)	3
CS 5050 Advanced Algorithms (F,Sp)	3
CS 5070 Computer Science Capstone (F,Sp,Su)	1
CS 5800 Introduction to Database Systems (F)	3
CS 5850 Systems Analysis (Sp)	3
ECON 1500 (BAI) Introduction to Economic Institutions, History, and Principles (F,Sp)	3
MATH 1100 (QL) Calculus Techniques (F,Sp,Su)	3

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MHR 3110 (DSS) Managing Organizations and People (F,Sp).....	3
MHR 3710 Developing Team and Interpersonal Skills (F,Sp).....	3
PHIL 2400 (BHU) Ethics (Sp) (3 cr) or	
PHIL 2500 (BHU) Social Ethics (F) (3 cr) or	
PHIL 3520 (DHA) Business Ethics (Sp) (3 cr) or	
PHIL 4530 (DSC) Ethics and Biotechnology (Sp) (3 cr) or	
PHIL 4540 (DHA) Human Values and Information Technology (Sp) (3 cr)	3
STAT 2300 (QL) Business Statistics (F,Sp,Su)	4
Advisor-approved computer science classes numbered 5000 or above	10
Advisor-approved electives	1-2

Minor

Requirements for a minor in computer science are listed below. Before beginning any minor, a student must meet with a departmental advisor and file an approved minor application form with the Computer Science Department.

Computer Science Minor (16-18 credits)

A. Required Courses (10 credits)

CS 1700 Introduction to Computer Science—CS 1 (F,Sp,Su)	3
CS 1710 Introduction to Computer Science—CS 1 Lab (F,Sp,Su)	1
CS 1720 (QI) Introduction to Computer Science—CS 2 (F,Sp,Su)	3
CS 2200 (QI) Algorithms and Data Structures—CS 3 (F,Sp,Su)	3

B. Computer Science Electives (6-8 credits)

Two additional CS classes must be selected from the following:

CS 2370 (CI) Software Engineering (F,Sp)	3
CS 2550 Computer Organization (F, Sp).....	3
CS 3100 Operating Systems and Concurrency (F,Sp).....	3
CS 3550 Computer Architecture (F,Sp)	3
CS 4700 Programming Languages (F,Sp)	3
Any CS class numbered 5000 or above	3 or 4
At least one of these two electives must be numbered at the 3000 level or above.	

Departmental Honors

Students who would like to experience greater academic depth within their major are encouraged to enroll in departmental honors. Through original, independent work, Honors students enjoy the benefits of close supervision and mentoring, as they work one-on-one with faculty in select upper-division departmental courses. Honors students also complete a senior project, which provides another opportunity to collaborate with faculty on a problem that is significant, both personally and in the student's discipline. Participating in departmental honors enhances students' chances for obtaining fellowships and admission to graduate school. Minimum GPA requirements for participation in departmental honors vary by department, but usually fall within the range of 3.30-3.50. Students may enter the Honors Program at almost any stage in their academic career, including at the junior (and sometimes senior) level. The campus-wide Honors Program, which is open to all qualified students regardless of major, offers a rich array of cultural and social activities, special classes, and the benefit of Honors early registration. Interested students should contact the Honors Program, Merrill Library 374, (435) 797-2715, honors@cc.usu.edu. Additional information can be found online at:

<http://www.usu.edu/honors/>

Additional Information

For more information about requirements for the Computer Science major and minor, see the major requirement sheet, available from the Computer Science Department, or online at:

<http://www.usu.edu/ats/majorsheets/>

Graduate Programs

Computer science deals with the programming, use, management, and organization of computers. Graduate students specialize in many different areas, several of which have strong ties to other disciplines such as mathematics, computer engineering, statistics, accounting, and business administration.

Admission Requirements

Applicants for admission to the graduate program should have a bachelor's degree in computer science **or** extensive experience in computing. Normally, a score of at least 640 on the quantitative test of the general GRE is required for admission to the MS, and a score of at least 700 is required for admission to the PhD or MCS. For scores less than these, applicants must show other strengths in their backgrounds to be considered for admission. The GRE computer science subject exam is not required for admission. Those who do take the GRE computer science subject exam will have preference in consideration for the award of financial aid. Decisions on financial aid are made on or near March 15 for the following fall semester.

Course Requirements

In addition to the specific departmental admission and degree requirements described in this section, students are advised that they must also meet all Graduate School requirements as described in the Graduate School section of this catalog. Please note that departmental requirements change from time to time, so students should work closely with their advisor in designing their graduate program. Graduate-level courses outside the department *may* be acceptable for the graduate degree. In all cases, approval of the candidate's graduate committee should be obtained *before* registering for such courses.

Graduate students who have not taken or passed at the 50th percentile the computer science GRE subject exam are required to meet departmental placement requirements before completion of their first year. Students who have not met this requirement after the first year, as a minimum, will not be eligible for department-funded financial aid and cannot submit their program of study. In some circumstances, students will be terminated in the program. The department placement requirement is met in one or a combination of the following three ways:

1. Pass three of six placement exams: Computer Architecture and Organization, Algorithms and Data Structures, Operating Systems, Automata, Programming Languages/Compilers, and Software Engineering.
2. Complete with a grade of at least *B-* three of the following departmental placement courses: CS 3550 or ECE 5750 (architecture); CS 2200 (algorithms and data structures); CS 3100 (operating systems); CS 4700 or 5300 (programming languages); and CS 2370, 5370, or 6370 (software engineering).
3. Show on an official transcript from an accredited college or university the completion of three courses deemed by the department to be equivalent to its placement courses. These must be semester-based courses of at least 3 credits, and the corresponding grade must be at least a *B-*.

Master of Science (MS)

Whether Plan A, Plan B, or Plan C (see School of Graduate Studies general requirements), all MS/CS students must meet the following general requirements:

Department of Computer Science

1. Complete four Computer Science courses numbered between 6000 and 6950. CS 6250 and 6900 are *not accepted* for these four courses. CS 6950 can count as *only one* of these four courses, and in that case must be taken for at least 3 credits in a single semester.
2. Complete 1 credit of CS 6900.

No more than 3 total credits in CS 5950, 6950, and 7950 and 1 credit of CS 6900 may be used to satisfy the MS degree requirements. CS 6250 cannot be used to meet MS coursework requirements. A maximum of 15 credits of committee-approved coursework below the 6000-level may be used for the MS degree.

Students completing a **Plan A MS degree** must fulfill the following requirements:

1. Complete at least 24 credits of graduate coursework. The total GPA must be at least 3.0, and no more than two class grades below *B-* and none below *C* may be included.
2. Successfully meet the departmental placement requirement.
3. Successfully complete and submit a graduate thesis proposal.
4. Successfully complete and defend a graduate thesis, based on original work (CS 6970, 6 credits).

Students completing a **Plan B MS degree** must fulfill the following requirements:

1. Complete at least 32 credits of graduate coursework. The total GPA must be at least 3.0, and no more than two class grades below *B-* and none below *C* may be included.
2. Successfully meet the departmental placement requirement.
3. Successfully complete and submit a graduate report proposal.
4. Successfully complete and defend a graduate report (CS 6970, 2 credits).

Students completing a **Plan C MS degree** must fulfill the following requirements:

1. Complete at least 37 credits of graduate coursework. The total GPA must be at least 3.0, and no more than two class grades below *B-* and none below *C* may be included.
2. Successfully meet the departmental placement requirement.
3. In addition to the four 6000-level courses required of all MS/CS students, successfully complete one pair of courses representing a sequence offered by the department: CS 5200 and 6200; CS 5300 and 6300; CS 5600 and 6600; CS 5650 and 6650; CS 5700 and 6700.

Master of Computer Science (MCS)

The Master of Computer Science (MCS) is a terminal degree with coursework requirements similar to the PhD, but lacking the PhD's requirement for original research. Students completing an MCS degree must fulfill the following requirements:

1. Complete at least 60 credits of graduate coursework beyond the BS/CS or 30 credits of graduate coursework beyond the MS/CS with a minimum class grade of *B-* and a minimum cumulative GPA of 3.2.
2. No more than 15 credits of coursework numbered below 6000 may be used for the MCS.
3. Complete at least 12 credits of 7000-level computer science coursework.
4. Successfully meet the departmental placement requirement.
5. Successfully complete and submit a research report proposal.
6. Successfully complete and defend a research report, based on original work (CS 7970, 6 credits).
7. Complete 1 credit of CS 6900.

Doctor of Philosophy (PhD)

The Doctor of Philosophy in Computer Science is, above all else, a degree of quality. Simply completing a number of graduate courses or years of study is not sufficient to receive the degree. The successful candidate must demonstrate a breadth of understanding in computer science, as well as a depth of understanding in his or her chosen area(s) of emphasis. Also, students must show an ability to do creative research. This research should be carried out over a significant period of time (i.e., at least one year or three semesters). Thus, each successful PhD candidate will produce a significant piece of original research, presented in a written dissertation and defended in an oral examination. This work should be of such quality that one or more journal or conference articles can be derived from it.

Students completing a PhD/CS must fulfill the following requirements:

1. Complete at least 90 credits of graduate coursework (including at least 27 credits of dissertation/research) beyond a BS/CS or at least 60 credits (including at least 27 credits of dissertation research) beyond an MS/CS with a minimum class grade of *B* and a minimum cumulative GPA of 3.5.
2. Successfully meet the departmental placement requirement.
3. If an MS/CS is completed first, then no more than 15 credits of the 60 credits required for the PhD may be taken in coursework numbered below the 6000 level. If an MS/CS is not completed first, then no more than 21 credits of the 90 credits required for the PhD may be taken in coursework numbered below the 6000 level.
4. Complete at least 12 credits of 7000-level computer science coursework.
5. Complete 2 credits of PhD Seminar (CS 7900).
6. Complete 9 credits of department-approved business administration or business management courses.
7. Pass a set of comprehensive written examinations and an oral examination showing depth and breadth of knowledge in computer science and the student's area(s) of emphasis.
8. Successfully complete and defend a research proposal.

Department of Computer Science

9. Successfully complete and defend a dissertation (CS 7970, for at least 27 credits).
10. Complete 1 credit of CS 6900.

Financial Assistance

Applicants for admission will automatically be considered for financial aid, with no need for additional application procedures. Continuing students will be requested to apply for aid during the spring semester. Acceptance into the program does not guarantee financial assistance.

Computer Science Faculty

Professors

Scott R. Cannon, parallel processing, real-time systems, biomedical applications

Heng-Da Cheng, image processing, artificial intelligence, parallel processing, computer vision, fuzzy logic, VLSI algorithms and architectures, neural networks

Donald H. Cooley, fuzzy logic, evolutionary algorithms, neural networks, multimedia systems

Professor Emeritus

Wendell L. Pope, data structures, automatic software generation, programming languages

Associate Professors

Stephen J. Allan, parallel processing, parallel programming, recognition of parallelism, program optimization

Vicki H. Allan, instruction-level parallelism, register allocation, software pipelining, program optimization

Stephen W. Clyde, software engineering, object orientation, distributed systems, database theory, multimedia systems

Hugo de Garis, artificial intelligence, neural networks, genetic algorithms

Nelson T. Dinerstein, analysis and construction of information systems, database management systems, applications of small computers

Nicholas S. Flann, machine learning, artificial intelligence

Gregory W. Jones, computability, GUIs, software engineering

Daniel W. Watson, parallel and heterogeneous computing, interconnection networks

Associate Professor Emeritus

Larre N. Egbert, scientific computing, computer graphics

Assistant Professors

Robert F. Erbacher, computer graphics, visualization, computer security, bioinformatics, GUIs, systems

Vladimir Kulyukin, cognitive robotics, speech and language processing

Seungjin Lim, data mining, semi-structured databases, bioinformatics

Xiaojun Qi, image processing, data mining

Lecturers

Kendra S. Dinerstein, introductory programming

Linda Duhadway, computer science education

Mary Veronica Kolesar, introductory computing

Temporary Lecturer

Dean Mathias, computer graphics

Course Descriptions

Computer Science (CS), pages 490-493

Interdepartmental Program in Ecology

Director: Martyn M. Caldwell
Location: Natural Resources 314
Phone: (435) 797-2555
FAX: (435) 797-3872
E-mail: mmc@cc.usu.edu
WWW: <http://www.usu.edu/ecology/>

Assistant Director for Administrative Affairs:

Marvin C. Bennett, Natural Resources 314B, (435) 797-2090,
marvb@cc.usu.edu

Degrees offered: Master of Science (MS) and Doctor of Philosophy (PhD) in the following departments: Aquatic, Watershed, and Earth Resources; Biology; Forest, Range, and Wildlife Sciences; and Plants, Soils, and Biometeorology

Graduate Program

The ecology program at Utah State University is administered by the interdepartmental Ecology Center. Its goals are to promote research and graduate education in the science of ecology and to provide expert, professional information and advice for decision makers considering actions that affect the environment. The research carried out by the center's associates covers the full spectrum of ecology on several continents, but most of it is centered in the montane and desert regions of the western United States.

Students earn their degrees in ecology while maintaining residence in one of the participating departments; the center itself does not grant degrees. The candidate selects and is assigned a major professor from the department appropriate to his or her interests.

Degree Requirements

Requirements for graduate degrees in ecology include the University and departmental degree requirements, as well as the Ecology Center requirements outlined below, which are formulated by the Ecology Center Faculty Advisory Committee. This committee is comprised of faculty representatives, designated by the respective department heads, from the departments of Aquatic, Watershed, and Earth Resources; Biology; Environment and Society; Forest, Range, and Wildlife Sciences; Geology; and Plants, Soils, and Biometeorology. The Ecology Center director chairs the committee.

The ecology MS and PhD are research degrees requiring a research thesis or dissertation. The following course requirements for each of these degrees fall into two categories. The first is a general science category. Students receiving graduate degrees in ecology are expected to have some breadth and sophistication in modern science. The second category includes ecology course requirements. These are for the most part general requirements, with the specific courses taken by each student selected by his or her graduate committee and tailored to his or her needs and professional goals.

Ecology MS and PhD Degrees General Science Requirements

For further details, see the USU Ecology Center website:
<http://www.usu.edu/ecology/>

Mathematics, Chemistry, Physics, and Computer Science

By its very nature, ecology must draw upon knowledge from most branches of science. As a result, at least a reasonable facility with fundamental mathematics and physical sciences must be attained by students, since these concepts have expression throughout the sciences. In order to assure a minimal comprehension in these areas, students receiving graduate degrees in ecology are required to have had the following at some point in their university careers:

1. Equivalent of mathematics through one semester of calculus.
2. Equivalent of at least a one-semester overview course in physics.
3. Chemistry through organic.
4. One year of introductory statistics and one graduate-level statistics course.

These courses are the minimum requirements for the MS and PhD degrees. The committee strongly recommends developing greater facility by taking at least a full year of calculus; one or more courses from the set of three including linear algebra, differential equations, and multi-variable calculus; and a full year of professional-level physics.

Biology

The following are required of all ecology graduate students, and must be taken at some point during their university career:

1. Genetics or evolution, one course.
2. One course in animal physiology for students emphasizing animal ecology.
3. One course each in plant physiology and soils for students emphasizing plant ecology.

Ecology Course Requirements

Master of Science

1. Attendance in Ecology Seminar (AWER/BIOL/ENVS/ FRWS 6870) is required each semester in residence.
2. A one-semester course in Graduate General Ecology (AWER BIOL/ENVS/FRWS 6960) is also required.
3. One course must be taken in each of two functional (core) blocks. The three available blocks are shown on the following page.

Doctor of Philosophy

1. Attendance in Ecology Seminar (AWER/BIOL/ENVS/ FRWS 6870) is required each semester in residence.
2. A one-semester course in Graduate General Ecology (AWER BIOL/ENVS/FRWS 6960) is also required.
3. One course must be taken from each functional (core) block. Students continuing from the MS to the PhD degree can apply block courses taken for the MS degree to the PhD requirement. The three available blocks are shown on the following page.

Interdepartmental Program in Ecology

Functional (Core) Blocks

1. Biophysical and Physiological Ecology
(AWER/GEOL 6150, AWER/BMET/GEOL 6680, BMET 6500, 6800, BIOL 6600, FRWS/SOIL 6350, FRWS 7200, SOIL 6130)
2. Organismic, Population, and Evolutionary Ecology
(AWER 6230/7230, BIOL 6260, 6380, FRWS 6400, 6720/7720, 7400)

3. Community, Ecosystem, and Landscape Ecology
(AWER 6120/7120, 6820/7820, BIOL/FRWS/SOIL 6200, BIOL 6010, 6590, FRWS 6610, 6710/7710, 6770)

Department Head: Christopher Fawson

Location: Business 615

Phone: (435) 797-2310

FAX: (435) 797-2701

E-mail: econinfo@econ.usu.edu

WWW: http://www.econ.usu.edu

Undergraduate Advisor:

Amanda Cram, Business 615, (435) 797-2290,
acram@econ.usu.edu

Graduate Program Director:

Paul M. Jakus, Business 304, (435) 797-2309, pjakus@econ.usu.edu

Degrees offered: Bachelor of Science (BS) in Agribusiness; Bachelor of Arts (BA) in International Agribusiness; BS in Agricultural Economics; Master of Science (MS) in Applied Economics; BS, BA, MS, Master of Arts (MA), and Doctor of Philosophy (PhD) in Economics; participates in Master of Business Administration (MBA); participates in International MBA in Food and Agribusiness (offered through the Royal Agricultural College in Cirencester, England). The Agribusiness and Economics majors are structured to facilitate a dual major with companion majors within or outside the College of Business.

Undergraduate emphases: *BS, BA in Economics*—Economic Theory, Managerial Economics, Prelaw Economics

Graduate specializations: *MS in Applied Economics*—Agricultural Economics, Natural Resource Economics, and Regional Economic Development

The Department of Economics is jointly administered by the College of Agriculture and the College of Business. Programs in both the College of Agriculture and the College of Business are offered.

Undergraduate Programs

Objectives

Undergraduate economics provides students with the basic intellectual framework to understand and analyze economic problems and to make informed decisions. A basic understanding of economics is essential to becoming a well-informed citizen, as well as a successful business or public leader.

Admission Requirements

Freshmen who meet the admission requirements and are accepted in good standing by the University are eligible for admission to the College of Agriculture, the College of Business, and the Department of Economics. All transfer students, whether transferring from within Utah State University or from other colleges and universities, must have an overall minimum GPA of 2.2 to be accepted as majors in the department. Additional requirements may apply for students who seek to be admitted to a dual major.

New students wishing to major in the Department of Economics may do so by listing one of the departmental majors on their application when they apply for admission to USU. Students enrolled at USU may change to a departmental major by applying directly to the College of Agriculture, the College of Business, or the Department of Economics.

Graduation Requirements

To receive a bachelor's degree in Agribusiness, Agricultural Economics, Economics, or International Agribusiness, students must complete all University requirements and the college and departmental requirements for their specific major as noted below. **Students may not obtain more than one major or minor in the Department of Economics.**

Agribusiness Major

The Agribusiness major provides a foundation for employment in the agricultural sectors and rural regions and in businesses serving agriculture and rural regions, such as banks and financial institutions, production, marketing and buying cooperatives, value-added food producers, real estate and land management, agricultural chemical production and sales, and farms and ranches. Graduates of this program are employed in a variety of agribusiness operations throughout the United States. Agribusiness graduates have achieved prominence in positions in wholesale and retail sales and service, stock and commodity brokerage, real estate appraisal, banking and farm credit, insurance, and in farm and ranch operations. Classwork provides training in basic business and economics, as well as the specific management tools required for agricultural enterprises.

To graduate with a bachelor's degree in Agribusiness, a student must have a major GPA of 2.5 or higher, as well as a grade of C or better in each course required for the major. A C grade or better in ECON 1500, MATH 1100, STAT 2300, and PSY 1010 or SOC 1010 and an overall GPA of 2.67 or higher is required for admission into some required BA and MHR courses. Agribusiness majors with a dual major must satisfy the admission and graduation requirements of both majors. All required courses must be taken for a letter grade. ECON 3900, 4950H, 4990, and 5950 cannot be used to meet economics elective requirements.

Agribusiness Major Requirements

All courses required for the Agribusiness Major should be taken for a letter grade. Students must earn a grade of C or better in each course.

Required Courses:

ACCT 2010 Survey of Accounting I (F,Sp,Su).....	3
ACCT 2020 Survey of Accounting II (F,Sp,Su).....	3
ASTE 3090 Computer Applications in Agriculture (F) (3 cr) or	
BIS 2450 Spreadsheets and Databases for Business (F,Sp,Su) (3 cr).....	3
ASTE 3050 (CI) Technical and Professional Communication Principles in Agriculture (F,Sp) (3 cr) or	
BIS 2550 (CI) Business Communication (F,Sp,Su) (3 cr)	3
ECON 1500 (BAI) Introduction to Economic Institutions, History, and Principles (F,Sp,Su).....	3
ECON 1550 (BSS) Introduction to Environmental and Natural Resource Economics (F) (3 cr) or	
ECON 2010 (BSS) Introduction to Microeconomics (F,Sp,Su) (3 cr)....	3
ECON 3030 (DSS) Introduction to Agribusiness Marketing (F).....	3
ECON 3050 (DSS) Introduction to Agribusiness Management (Sp).....	3
ECON 4010 (DSS) Managerial Economics (F,Sp)	3
ECON 4030 (CI) Agribusiness Finance (F)	3
ECON 5030 Agricultural Marketing and Price Analysis (F)	3
ECON 5050 Farm and Ranch Planning and Analysis (Sp)	3
ECON 5350 (CI) Agribusiness, Cooperatives, and Management (Sp)..	3
MATH 1050 (QL) College Algebra (F,Sp,Su).....	4
MATH 1100 (QL) Calculus Techniques (F,Sp,Su)	3
MHR 2990 Legal and Ethical Environment of Business (F,Sp,Su).....	3

Department of Economics

STAT 2300 (QL) Business Statistics (F,Sp,Su)	4
College of Agriculture electives ¹	12

¹These 12 credits must be selected from courses offered by departments within the College of Agriculture, excluding courses offered by the Department of Economics. Six of the 12 credits must be chosen from upper-division courses (i.e., courses numbered 3000 or above).

Agribusiness Major, Business Option

All courses required for the Agribusiness Major, Business Option should be taken for a letter grade. Students must earn a grade of C or better in each course. Students who complete the Business Core requirements with a 2.67 minimum GPA are eligible to earn a dual major in Business. Note: Student transcripts and diplomas will list *only* the Agribusiness Major, not the Business Option.

Business Core:

ACCT 2010 Survey of Accounting I (F,Sp,Su).....	3
ACCT 2020 Survey of Accounting II (F,Sp,Su).....	3
BA 3400 (QI) Corporate Finance (F,Sp,Su)	3
BA 3500 Fundamentals of Marketing (F,Sp,Su).....	3
BA 3700 Operations Management (F,Sp,Su).....	3
BIS 2450 Spreadsheets and Databases for Business (F,Sp,Su)	3
BIS 2550 (CI) Business Communication (F,Sp,Su).....	3
ECON 1500 (BAI) Introduction to Economic Institutions, History, and Principles (F,Sp,Su).....	3
ECON 2010 (BSS) Introduction to Microeconomics (F,Sp,Su)	3
ECON 3400 (DSS) International Economics for Business (F,Sp,Su).....	3
MATH 1050 (QL) College Algebra (F,Sp,Su).....	4
MATH 1100 (QL) Calculus Techniques (F,Sp,Su)	3
MHR 2990 Legal and Ethical Environment of Business (F,Sp,Su).....	3
MHR 3110 (DSS) Managing Organizations and People (F,Sp,Su)	3
MHR 4880 (CI) Business Strategy in an Entrepreneurial Context (F,Sp) (3 cr) or	
MHR 4890 (CI) Business Strategy in a Global Context (3 cr)	3
STAT 2300 (QL) Business Statistics (F,Sp,Su)	4

Additional Courses:

ECON 3030 (DSS) Introduction to Agribusiness Marketing (F).....	3
ECON 3050 (DSS) Introduction to Agribusiness Management (Sp)	3
ECON 4010 (DSS) Managerial Economics (F,Sp)	3
ECON 4030 (CI) Agribusiness Finance (F)	3
ECON 5030 Agricultural Marketing and Price Analysis (F)	3
ECON 5050 Farm and Ranch Planning and Analysis (Sp)	3
ECON 5350 (CI) Agribusiness, Cooperatives, and Management (Sp).....	3

Agribusiness Major, Agricultural Systems Option

All courses required for the Agribusiness Major, Agricultural Systems Option should be taken for a letter grade. Students must earn a grade of C or better in each course. Students who complete this option are eligible to earn a dual major in Agricultural Systems Technology. Note: Student transcripts and diplomas will list only the Agribusiness Major, not the Agricultural Systems Option.

Required Courses:

ACCT 2010 Survey of Accounting I (F,Sp,Su).....	3
ACCT 2020 Survey of Accounting II (F,Sp,Su).....	3
ASTE 1010 Introduction to Agricultural Systems Technology (F).....	3
ASTE 2200 Electricity in Agricultural Systems (Sp)	3
ASTE 3030 Metal Welding Processes and Technology in Agriculture (F) (3 cr) or	
ASTE 4100 Agricultural Structures and Environment (Sp) (3 cr)	3
ASTE 3050 (CI) Technical and Professional Communication Principles in Agriculture (F,Sp)	3
ASTE 3090 Computer Applications in Agriculture (F,Sp)	3
ASTE 3080 Compact Power Units for Agricultural and Turfgrass Applications (Sp) (3 cr) or	

ASTE 3200 Irrigation Principles and Practices (Sp) (3 cr)	3
ASTE 3600 (QI) Management of Agricultural Machinery Systems (Sp).....	3
ASTE 5260 (CI) Environmental Impacts of Agricultural Systems (F)	3
ECON 1500 (BAI) Introduction to Economic Institutions, History, and Principles (F,Sp,Su).....	3
ECON 1550 (BSS) Introduction to Environmental and Natural Resource Economics (F) (3 cr) or	
ECON 2010 (BSS) Introduction to Microeconomics (F,Sp) (3 cr)	3
ECON 3030 (DSS) Introduction to Agribusiness Marketing (F).....	3
ECON 3050 (DSS) Introduction to Agribusiness Management (Sp)	3
ECON 4010 (DSS) Managerial Economics (F,Sp)	3
ECON 4030 (CI) Agribusiness Finance (F)	3
ECON 5030 Agricultural Marketing and Price Analysis (F)	3
ECON 5050 Farm and Ranch Planning and Analysis (Sp)	3
ECON 5350 (CI) Agribusiness, Cooperatives, and Management (Sp).....	3
MATH 1050 (QL) College Algebra (F,Sp,Su).....	4
MATH 1100 (QL) Calculus Techniques (F,Sp,Su)	3
MHR 2990 Legal and Ethical Environment of Business (F,Sp,Su).....	3
STAT 2300 (QL) Business Statistics (F,Sp,Su)	4

Agricultural Economics Major

The Agricultural Economics major emphasizes the development of quantitative skills in and a deeper understanding of economic theory. While this program provides a solid base for individuals desirous of careers in agricultural businesses, it is also an excellent preparation for graduate studies in economics, agricultural economics, natural resources, business, or law. The Agricultural Economics degree provides an excellent background for work in federal, state, and local government, as well as in the private sector. Graduates of this program are now working in positions involving the analysis of prices and markets, preparation of economic feasibility studies, and preparing economic forecasts.

To graduate with a bachelor's degree in Agricultural Economics, a student must have a major GPA of 2.5 or higher, as well as a grade of C or better in each course required for the major. All required courses must be taken for a letter grade.

Agricultural Economics Major Requirements

All courses required for the Agricultural Economics Major should be taken for a letter grade. Students must earn a grade of C or better in each course.

Required Courses:

ACCT 2010 Survey of Accounting I (F,Sp,Su).....	3
ACCT 2020 Survey of Accounting II (F,Sp,Su).....	3
ASTE 3090 Computer Applications in Agriculture (F,Sp) (3 cr) or	
BIS 2450 Spreadsheets and Databases for Business (F,Sp,Su) (3 cr)	3
ASTE 3050 (CI) Technical and Professional Communication Principles in Agriculture (F,Sp) (3 cr) or	
BIS 2550 (CI) Business Communication (F,Sp,Su) (3 cr)	3
ECON 1500 (BAI) Introduction to Economic Institutions, History, and Principles (F,Sp,Su).....	3
ECON 2010 (BSS) Introduction to Microeconomics (F,Sp,Su)	3
ECON 3030 (DSS) Introduction to Agribusiness Marketing (F).....	3
ECON 3050 (DSS) Introduction to Agribusiness Management (Sp)	3
ECON 3400 (DSS) International Economics for Business (F,Sp,Su).....	3
ECON 4030 (CI) Agribusiness Finance (F)	3
ECON 5000 Macroeconomics (F)	3
ECON 5010 Microeconomics (Sp)	3
ECON 5030 Agricultural Marketing and Price Analysis (F)	3
ECON 5310 (QI) Mathematical Methods for Economics (F)	3
ECON 5330 (QI) Applied Econometrics (Sp)	3
MATH 1050 (QL) College Algebra (F,Sp,Su).....	4

MATH 1100 (QL) Calculus Techniques (F,Sp,Su)	3
STAT 2300 (QL) Business Statistics (F,Sp,Su)	4

Select three of the following courses:

ECON 5020 (CI) Economics and Public Policy (Sp)	3
ECON 5050 Farm and Ranch Planning and Analysis (Sp)	3
ECON 5350 (CI) Agribusiness, Cooperatives, and Management (Sp) ..	3
ECON 5560 Natural Resource and Environmental Economics (Sp)	3
ECON 5950 (CI) Senior Project (Sp)	3

International Agribusiness Major

The International Agribusiness major combines training in business, language skills, and economics courses that emphasize the role of the trade and development issues that are critical to operating in the increasingly internationalized agribusiness sector. The program provides a foundation for employment in agricultural and agribusiness sectors and in banks and financial institutions, production, marketing and buying cooperatives, value-added food producers, agricultural chemical production and sales, and farms and ranches in domestic and international settings. Classwork provides training in basic business and economics, as well as the specific management tools required for agricultural enterprises.

To graduate with a bachelor's degree in International Agribusiness, a student must have a major GPA of 2.5 or higher, as well as a grade of C or better in each course required for the major. All required courses must be taken for a letter grade. ECON 3900, 4950H, 4990, and 5950 cannot be used to meet economics elective requirements.

International Agribusiness Major Requirements

For this major, students must score three or better on the Federal FSI Test or complete a language minor. All the following courses should be taken for a letter grade. Students must earn a grade of C or better in each course.

Required Courses:

ACCT 2010 Survey of Accounting I (F,Sp,Su)	3
ASTE 6140 Agricultural Development and Evaluation (Sp)	3
BIS 2450 Spreadsheets and Databases for Business (F,Sp,Su)	3
ECON 1500 (BAI) Introduction to Economic Institutions, History, and Principles (F,Sp,Su)	3
ECON 2010 (BSS) Introduction to Microeconomics (F,Sp,Su)	3
ECON 3030 (DSS) Introduction to Agribusiness Marketing (F)	3
ECON 3050 (DSS) Introduction to Agribusiness Management (Sp)	3
ECON 3400 (DSS) International Economics for Business (F,Sp,Su)	3
ECON 4010 (DSS) Managerial Economics (F,Sp)	3
ECON 4020 Macroeconomics for Managers (F,Sp)	3
ECON 4030 (CI) Agribusiness Finance (F)	3
ECON 5030 Agricultural Marketing and Price Analysis (F)	3
ECON 5050 Farm and Ranch Planning and Analysis (Sp) (3 cr) or	
ECON 5950 (CI) Senior Project (Sp) (3 cr)	3
ECON 5120 Economics of Russia and Eastern Europe, 9th Century to 21st Century (F)	3
ECON 5350 (CI) Agribusiness, Cooperatives, and Management (Sp) ..	3
ECON 5400 International and Development Economics (F)	4
MATH 1050 (QL) College Algebra (F,Sp,Su)	4
MATH 1100 (QL) Calculus Techniques (F,Sp,Su)	3
NFS 5510 Food Laws and Regulations (Sp)	2
PLSC 4300 World Food Crops and Cropping Systems: The Plants That Feed Us (Sp)	3
STAT 2300 (QL) Business Statistics (F,Sp,Su)	4

Economics Major

Because the Economics major provides a strong grounding in economic theory, it helps open career opportunities that involve policy

analysis. The Economics major has been a very popular dual major for Finance and Accounting majors because of the added theoretical and analytical dimension that advanced studies in economics can contribute to Finance and Accounting majors. This combination is excellent preparation for students interested in advanced studies in Accounting or Finance.

The Economics major also provides students in the humanities, and social and natural sciences with an opportunity to learn policy analysis tools. Whether the students are directly interested in policy or simply interested in the impact of policy within their chosen primary major, economics introduces a robust and empirically verified paradigm for explaining the behavior of social systems and their interaction with cultural, biological, and physical resources.

To graduate with a bachelor's degree in Economics, a student must have a minimum GPA of 2.5 in courses required for the major and a grade of C or better in each course required for the major. A C grade or better in ECON 1500, MATH 1100, STAT 2300, and PSY 1010 or SOC 1010 and an overall GPA of 2.67 or higher is required for admission into some BA and MHR courses required for the managerial emphasis. Economics majors with a dual major must satisfy the admission and graduation requirements of both majors. All required courses must be taken for a letter grade. For information regarding elective requirements, students should contact their academic advisor.

Economics Major:

ECON 1500 (BAI) Introduction to Economic Institutions, History, and Principles (F,Sp,Su)	3
ECON 2010 (BSS) Introduction to Microeconomics (F,Sp,Su)	3
ECON 3400 (DSS) International Economics for Business (F,Sp,Su)	3
ECON 4010 (DSS) Managerial Economics (F,Sp) (3 cr) or	
ECON 5010 Microeconomics (Sp) (3 cr)	3
ECON 4020 Macroeconomics for Managers (F,Sp) (3 cr) or	
ECON 5000 Macroeconomics (F) (3 cr)	3
MATH 1050 (QL) College Algebra (F,Sp,Su)	4
MATH 1100 (QL) Calculus Techniques (F,Sp,Su)	3
STAT 2300 (QL) Business Statistics (F,Sp,Su)	4
Upper-division ECON electives	6

The **Economic Theory Emphasis** is designed for students who are interested in preparing for graduate studies in economics or agricultural economics and for students who are preparing for a career that requires training in quantitative economic analysis. Graduates have employment opportunities in business and government, as well as opportunities for continuing their education in graduate economics programs or in professional schools. Economists are often involved in policy analysis for government agencies and nongovernmental organizations.

Economics Major (Economic Theory Emphasis):

ACCT 2010 Survey of Accounting I (F,Sp,Su)	3
ACCT 1500 Survey of Accounting II (F,Sp,Su)	3
ECON 1500 (BAI) Introduction to Economic Institutions, History, and Principles (F,Sp,Su)	3
ECON 2010 (BSS) Introduction to Microeconomics (F,Sp,Su)	3
ECON 3400 (DSS) International Economics for Business (F,Sp,Su)	3
ECON 5000 Macroeconomics (F)	3
ECON 5010 Microeconomics (Sp)	3
ECON 5100 History of Economic Thought (Sp)	3
ECON 5310 (QI) Mathematical Methods for Economics (F)	3
ECON 5330 (QI) Applied Econometrics (Sp)	3
ECON 5950 (CI) Senior Project (Sp)	3
MATH 1050 (QL) College Algebra (F,Sp,Su)	4
MATH 1100 (QL) Calculus Techniques (F,Sp,Su)	3
STAT 2300 (QL) Business Statistics (F,Sp,Su)	4
ECON electives (3000-level or above) ²	12

Department of Economics

The Managerial Economics Emphasis is for students who are planning for careers in business. The program can serve as a terminal program for those planning to enter the job market on graduation or as excellent preparation for students who intend to pursue an MBA or MPA.

Economics Major (Managerial Economics Emphasis):

ACCT 2010 Survey of Accounting I (F,Sp,Su)	3
ACCT 2020 Survey of Accounting II (F,Sp,Su)	3
BA 3400 (QI) Corporate Finance (F,Sp,Su)	3
BA 3500 Fundamentals of Marketing (F,Sp,Su)	3
BA 3700 Operations Management (F,Sp,Su)	3
BIS 2450 Spreadsheets and Databases for Business (F,Sp,Su)	3
BIS 2550 (CI) Business Communication (F,Sp,Su)	3
BUS 1000 Business Orientation (F,Sp)	0.5
ECON 1500 (BAI) Introduction to Economic Institutions, History, and Principles (F,Sp,Su)	3
ECON 2010 (BSS) Introduction to Microeconomics (F,Sp,Su)	3
ECON 3400 (DSS) International Economics for Business (F,Sp,Su)	3
ECON 4010 (DSS) Managerial Economics (F,Sp)	3
ECON 4020 Macroeconomics for Managers (F,Sp)	3
ECON 5310 (QI) Mathematical Methods for Economics (F)	3
ECON 5330 (QI) Applied Econometrics (Sp)	3
ECON 5950 (CI) Senior Project (Sp)	3
MATH 1050 (QL) College Algebra (F,Sp,Su)	4
MATH 1100 (QL) Calculus Techniques (F,Sp,Su)	3
MHR 2990 Legal and Ethical Environment of Business (F,Sp,Su)	3
MHR 3110 (DSS) Managing Organizations and People (F,Sp)	3
PSY 1010 (BSS) General Psychology (F,Sp,Su) (3 cr) or	
SOC 1010 (BSS) Introductory Sociology (F,Sp) (3 cr)	3
STAT 2300 (QL) Business Statistics (F,Sp,Su)	4
ECON electives (3000-level and above) ²	6

The Prelaw Economics Emphasis is for students who plan to attend law school or pursue a career related to political science, and who want to obtain a strong foundation in economics. The large number of elective credits included in this emphasis area provides enough flexibility for students to custom design their program of study to meet individual interests and educational goals. Several students have taken advantage of this flexibility to design a dual major with Economics and Political Science.

Economics Major (Prelaw Economics Emphasis):

ECON 1500 (BAI) Introduction to Economic Institutions, History, and Principles (F,Sp,Su)	3
ECON 2010 (BSS) Introduction to Microeconomics (F,Sp,Su)	3
ECON 3170 Law and Economics (F) (3 cr) or	
POLS 3170 Law and Economics (F) (3 cr)	3
ECON 3400 (DSS) International Economics for Business (F,Sp,Su)	3
ECON 4010 (DSS) Managerial Economics (F,Sp) (3 cr) or	
ECON 5010 Microeconomics (Sp) (3 cr)	3
ECON 4020 Macroeconomics for Managers (F,Sp) (3 cr) or	
ECON 5000 Macroeconomics (F) (3 cr)	3
ECON 5950 (CI) Senior Project (Sp)	3
MATH 1050 (QL) College Algebra (F,Sp,Su)	4
MATH 1100 (QL) Calculus Techniques (F,Sp,Su)	3
POLS 1100 (BAI) United States Government and Politics (F,Sp)	3
STAT 2300 (QL) Business Statistics (F,Sp,Su)	4
ECON electives (3000-level or above) ²	6
POLS electives (3000-level or above)	3

Minor Requirements

Economics Minor:

ECON 1500 (BAI) Introduction to Economic Institutions, History, and Principles (F,Sp,Su)	3
ECON 2010 (BSS) Introduction to Microeconomics (F,Sp,Su) (3 cr) or	
ECON 1550 (BSS) Introduction to Environmental and Natural Resource Economics (F) (3 cr)	3

ECON 4010 (DSS) Managerial Economics (F,Sp) (3 cr) or	
ECON 5010 Microeconomics (Sp) (3 cr)	3
ECON electives (3000-level or above) ³	6

Economics Teaching Minor:

BIS 3000 Principles of Business and Marketing Education (F,Sp)	1
BIS 3300 Clinical Experience I (F,Sp) (1 cr) or	
BIS 4300 Clinical Experience II (F,Sp) (1 cr)	1
BIS 4400 Business Education and Marketing Education Methods (Sp)	3
ECON 1500 (BAI) Introduction to Economic Institutions, History, and Principles (F,Sp,Su)	3
ECON 2010 (BSS) Introduction to Microeconomics (F,Sp,Su) (3 cr) or	
ECON 1550 (BSS) Introduction to Environmental and Natural Resource Economics (F) (3 cr)	3
ECON 3400 (DSS) International Economics for Business (F,Sp,Su) (3 cr) or	
ECON 5400 International and Development Economics (F) (4 cr)	3 or 4
ECON 5100 History of Economic Thought (Sp)	3
ECON 5110 (DSS) Economic History of the United States (F)	3

Agribusiness Management Minor:

ACCT 2010 Survey of Accounting I (F,Sp,Su)	3
ECON 1500 (BAI) Introduction to Economic Institutions, History, and Principles (F,Sp,Su)	3
ECON 3030 (DSS) Introduction to Agribusiness Marketing (F)	3
ECON 3050 (DSS) Introduction to Agribusiness Management (Sp)	3
ECON 4030 (CI) Agribusiness Finance (F)	3

Agricultural Economics Minor:

ECON 1500 (BAI) Introduction to Economic Institutions, History, and Principles (F,Sp,Su)	3
ECON 2010 (BSS) Introduction to Microeconomics (F,Sp,Su) (3 cr) or	
ECON 1550 (BSS) Introduction to Environmental and Natural Resource Economics (F) (3 cr)	3
ECON 4010 (DSS) Managerial Economics (F,Sp) (3 cr) or	
ECON 5010 Microeconomics (Sp) (3 cr)	3
ECON 4030 (CI) Agribusiness Finance (F)	3
ECON 5030 Agricultural Marketing and Price Analysis (F)	3

²ECON 3900, 4950, 4990, and 5950 may not be used to meet this requirement.

³ECON 3900 cannot be used to meet economics elective requirements.

Departmental Honors

Students who would like to experience greater academic depth within their major are encouraged to enroll in departmental honors. Through original, independent work, Honors students enjoy the benefits of close supervision and mentoring, as they work one-on-one with faculty in select upper-division departmental courses. Honors students also complete a senior project, which provides another opportunity to collaborate with faculty on a problem that is significant, both personally and in the student's discipline. Participating in departmental honors enhances students' chances for obtaining fellowships and admission to graduate school. Minimum GPA requirements for participation in departmental honors vary by department, but usually fall within the range of 3.30-3.50. Students may enter the Honors Program at almost any stage in their academic career, including at the junior (and sometimes senior) level. The campus-wide Honors Program, which is open to all qualified students regardless of major, offers a rich array of cultural and social activities, special classes, and the benefit of Honors early registration. Interested students should contact the Honors Program, Merrill Library 374, (435) 797-2715, honors@cc.usu.edu. Additional information can be found online at: <http://www.usu.edu/honors/>

Financial Support

The Department of Economics, the College of Agriculture, and the College of Business award scholarships in addition to those available through the University Financial Aid Office. Information and application forms may be obtained from the college or departmental offices.

Additional Information

For more information about undergraduate programs in the Department of Economics, see the major requirement sheets, available from the department, or accessed online at:

<http://www.usu.edu/ats/majorsheets/>

Graduate Programs

The MA, MS, and PhD in Economics, along with the MS in Applied Economics, are offered jointly through the College of Agriculture and College of Business. The MBA is offered through the College of Business. The International MBA in Food and Agribusiness is offered through the Royal Agricultural College (RAC), Cirencester, England.

Objectives

Economics graduate training emphasizes economic theory, critical thinking, and quantitative analysis. This foundation is a means to an end, not an end in itself: theory and quantitative methods are tools used in applied courses, in theses and dissertations, and in other research and extension activities carried out in the department.

The **Master of Science** and **Master of Arts in Economics** are intended to prepare students for doctoral studies in economics. Consequently, students are required to take the same first-year core theory and econometrics courses as the PhD students, with specialization courses in the second year. The **MS in Applied Economics** is a terminal degree that prepares students for positions in industry; private consulting firms; local, regional, and national policy-making agencies; private not-for-profit organizations; and community/regional economic planning and development agencies. The **Doctor of Philosophy in Economics** is intended to prepare students for faculty and research positions with dual fields in Trade and Development and Natural Resource and Environmental Economics. All PhD students are required to complete these "field" sequences. Students interested in other specialties are discouraged from applying.

Admission Requirements

Applicants must have earned a bachelor's degree from an accredited college or university, maintained a grade point average of at least 3.0 for the last 60 semester credits earned, and score in at least the 40th percentile on the Graduate Record Exam (GRE). The Graduate Management Admission Test (GMAT) is required for the International MBA in Food and Agribusiness. In addition, international applicants from non-English-speaking countries must score at least 550 on the Test of English as a Foreign Language (TOEFL). Satisfaction of these minimum admission requirements does not guarantee admission. Applications for graduate study from students trained in disciplines other than economics are welcomed. However, all applicants are expected to have: (1) an understanding of intermediate microeconomic and macroeconomic theory, (2) preparation in mathematical economics, and (3) preparation in probability and statistics. In addition, applicants are expected to have strong written and oral communications skills.

Degree Requirements

Doctor of Philosophy in Economics

PhD students are required to: (1) complete the first-year core (ECON 7060, 7130, 7140, 7230, 7240, 7310, 7350, 7360, 7950); (2) perform successfully on a written qualifying examination based on the first-year core; (3) complete the advanced core (ECON 7150, 7250, 7320, 7330); (4) complete the International Trade and Development and Natural Resource and Environmental Economics field sequences (ECON 7400, 7500, 7510, 7800); (5) complete a research dissertation and give an oral defense of the dissertation; and (6) meet University requirements for dissertation research and total credit hours.

Master of Science in Applied Economics

To complete an MS degree in Applied Economics, students are required to: (1) complete the applied core (ECON 6000, 6060, 6100, 6300, 6330); (2) complete a specialization in: (a) agricultural economics (ECON 5300, 6030, 6040, 6250; ACCT 6350; BA 6520; MHR 5640), (b) natural resource economics (ECON 6500 and 6510), or (c) regional economic development (ECON 6700 and 6710); (3) submit and orally defend a thesis (Plan A) or research report (Plan B); and (4) complete elective class or thesis research credits to meet Plan A, B, or C graduation requirements. Plan A requires at least 30 credits and must include at least 6 thesis research credits. Plan B requires at least 30 credits and must include 2 to 3 thesis research credits. Plan C has no research component and requires at least 33 credits. (No more than 6 undergraduate credits may be used in meeting degree requirements.)

Master of Science and Master of Arts in Economics

Students are required to complete the first-year core (ECON 6000, 6060, 6100, 7140, 7240, 7310, 7350, 7360) and to submit and orally defend a thesis (Plan A) or research report (Plan B). The department also accepts Plan C, which has no research component. MA students must satisfy the foreign language requirement. Plan A requires at least 30 credits and must include at least 6 thesis research credits. Plan B requires at least 30 credits and must include 2 to 3 thesis research credits. Plan C requires at least 33 credits. (No more than 6 undergraduate credits may be used in meeting degree requirements.)

Master of Business Administration

A student may receive a College of Business Master of Business Administration degree with a specialization in an economic field by completing the MBA advanced core (see the MBA program description on pages 178-179) and 9 specialization credits. These specialization credits should be coordinated with the MBA Program director.

International MBA in Food and Agribusiness

The Department of Economics participates with the Royal Agricultural College (RAC) in Cirencester, England to offer this degree. The degree is awarded by the RAC. Students study at USU during fall semester, and then study spring semester at the RAC. Students complete a team project and a thesis. The degree is designed to prepare students to be agribusiness managers in an international environment. Applicants for admission to the International MBA are expected to have completed a common body of knowledge core at an AACSB accredited program. The common body of knowledge includes: ACCT 2010, 2020; BA 3400, 3500, and 3080 or 3700; BIS 2450; ECON 1500, 2010; MATH 1100; STAT 2300; and MHR 2990 and 3110. Alternatively, students may choose to gain the necessary competencies by attending the 18-credit Accelerated Business Core (BUS 6160), which is offered during summer semester. Required courses to be completed at USU include: ACCT 6350; ECON 6030, 6040, 6330; and BA 6520 or 4590. During spring semester, courses in finance, marketing and advertising,

Department of Economics

human resource management, macroeconomics, business strategy, agricultural food policy, and food chain industry are taught at the RAC. Participating students pay USU tuition and are expected to complete the program in 12-18 months.

Research

The department maintains an active and productive research program. The results of this research are published in professional journals, books, and technical reports. Financial support for the departmental research program is provided by the Utah Agricultural Experiment Station, the colleges of Agriculture and Business, the Office of the Vice President for Research, and by a combination of public and private extramural sources. The Economics Research Institute provides support and coordination for some of the department's research activities. Graduate students are an integral part of departmental research programs.

Financial Assistance and Assistantships

The department offers teaching and research assistantships to qualified graduate students. These are awarded on a competitive basis, and all accepted students are considered eligible. However, while the department makes every effort to assist students in obtaining financial assistance, acceptance into department programs does not guarantee financial assistance.

Financial assistance is not provided to PhD students who fail to pass the written qualifying exam nor to graduate students who fail to make satisfactory progress toward completion of their degrees.

Economics Faculty

Professors

DeeVon Bailey, agricultural economics
Basudeb Biswas, international trade and economic development
Keith R. Criddle, resource economics and quantitative methods
Christopher Fawson, public finance and econometrics
Terrence F. Glover, production economics and policy
E. Bruce Godfrey, agricultural and resource economics
L. Dwight Israelsen, comparative systems and economic history
Paul M. Jakus, natural resource and environmental economics, nonmarket valuation

John E. Keith, agricultural and resource economics
W. Cris Lewis, regional-urban and managerial economics
Kenneth S. Lyon, economic theory
H. Craig Petersen, regulation and antitrust and managerial economics;
Director of Analysis, Assessment, and Accreditation
Donald L. Snyder, agricultural and resource economics, Associate
Dean for Academic Programs

Professors Emeriti

Roice H. Anderson
Larry K. Bond
Rondo A. Christensen
Lynn H. Davis
Reed R. Durtschi
Herbert H. Fullerton
Gary B. Hansen
Allen D. LeBaron
Darwin B. Nielsen
Morris D. Whitaker

Associate Professors

Tyler J. Bowles, econometrics and international economics
Steven S. Vickner, agribusiness, food marketing

Associate Professor Emeritus

Glenn F. Marston

Assistant Professors

Arthur J. Caplan, environmental economics and applied
microeconomic theory
John P. Gilbert, international trade theory and policy, applied general
equilibrium modeling, development economics
Makoto Nirei, macroeconomics, econometrics
Gholamreza Oladi, international economics, econometrics
Rimma Shiptsova, international trade, food safety, econometrics
Ruby A. Ward, agribusiness management and operations research

Human Resources Specialist

Marion T. Bentley, manpower economics

Course Descriptions

Economics (ECON), pages 494-497

Interdepartmental Doctoral Program in Education (EdD, PhD)

Chairman:

Carol J. Strong, Interim Dean of College of Education and Human Services

Location: Emma Eccles Jones Education 109

Phone: (435) 797-1437

FAX: (435) 797-3939

E-mail: idphelp@usu.edu

WWW: <http://www.coe.usu.edu/>

Faculty: Faculty are listed with participating departments.

Degrees offered: Doctorate of Education (EdD) and Doctorate of Philosophy (PhD)

Graduate specializations: PhD or EdD— Business Information Systems, Curriculum and Instruction, and Research and Evaluation; EdD—Special Education

Admission Requirements

For admission information, contact: Dean, School of Graduate Studies, Utah State University, 0900 Old Main Hill, Logan UT 84322-0900; telephone (435) 797-1189; FAX (435) 797-1192; gradsch@cc.usu.edu.

To be evaluated against established criteria, students must submit to the School of Graduate Studies at Utah State University an

Application for Admission along with the following:

1. Two official transcripts of both undergraduate and graduate credits from all colleges or universities attended. An average grade of *B* (3.0) or better is required during the last two years of undergraduate work and for all graduate work.
2. Three letters of recommendation (required). At least two of these letters should come from individuals who can evaluate the student's academic abilities. All letters should address the student's potential for successful graduate study.
3. Documentation of a master's degree or equivalent coursework related to an area of specialization, or a statement of why admission is sought without a master's degree.
4. An official report of the Graduate Record Examination (GRE), including both the Verbal and the Quantitative subtests.
5. Evidence of writing competency as determined by the department of specialization.
6. A statement of specific reasons for wanting to enroll in the doctoral program in education, including the area of specialization student desires to pursue.

Applicants to the Curriculum and Instruction specialization of the PhD and EdD degrees must have appropriate teaching experience.

General Information

Students may select from one of three specializations within the Interdepartmental Doctoral Program: Business and Information Systems (BIS), Curriculum and Instruction (C & I), and Research and Evaluation (R & E).

Both the **Doctorate of Education (EdD)** and the **Doctorate of Philosophy (PhD)** degrees are offered through the Interdepartmental Doctoral Program (IDP) in the College of Education and Human Services (CEHS). The IDP is an interdepartmental faculty effort.

The EdD degree program is intended for students who wish to be better prepared to (1) understand and deal effectively with curricular and instructional problems as administrators, supervisors, and curriculum specialists in public or private educational institutions and settings; and (2) teach in community colleges, four-year colleges, and universities. The PhD degree program is intended for students who wish to be better prepared to (1) fulfill roles in teaching and research in colleges, universities, and education-related fields; and (2) conduct and direct research and development activities in public and private educational settings or in the corporate sector.

Specializations

Business Information Systems

The BIS specialization prepares graduates for careers as teachers or educational leaders in the public schools and/or faculty members in higher education. Areas of emphasis include business information systems, communication, business and/or marketing education, and training and development.

Curriculum and Instruction

The C & I specialization prepares graduates to serve as curriculum specialists and instructional leaders in school districts and state educational agencies, professors in colleges of education, and subject area instructors in four-year or community colleges. Areas of emphasis include early childhood; engineering and technology education; instructional leadership; reading/writing; schooling, culture, and society; and teaching and learning in higher education.

Research and Evaluation

The R & E specialization prepares graduates to evaluate the quality of educational programs, including the comparison of strengths and weaknesses of alternative programs; the revision, updating, and/or redirection of existing programs; and the analysis of related educational issues.

Planned Program

To complete a doctorate degree, a minimum of 60 total credits are required for students with a master's degree, and a minimum of 90 total credits are required for students without a master's degree. A student must:

1. Complete a Unifying Program of Studies Core (6 semester credits) and a Research and Statistics Core (12 semester credits), required of all doctoral students.
2. Complete a planned program of supporting electives, as designated by the specialization or by a department and approved by the student's supervisory committee.
3. Pass a written comprehensive examination. This exam must be satisfactorily completed before the student advances to candidacy. Advancement to candidacy also requires an approved dissertation proposal.
4. Present at a professional conference.
5. Submit for publication an approved manuscript.
6. Complete and satisfactorily defend a doctoral research study directed and judged by a supervisory committee of faculty.

Interdepartmental Doctoral Program in Education (EdD, PhD)

7. Complete all final requirements, as specified by an area of specialization, the College of Education and Human Services, and the School of Graduate Studies.

Resident Coursework

The **Doctorate of Philosophy degree (PhD)** requires three semesters of full-time registration in residency with a minimum of two semesters of consecutive residency. Completion of 33 credits in residence on the Logan campus is required.

The **Doctorate of Education degree (EdD)** requires at least three semesters in full-time residency, but they need not be consecutive. At least two semesters must be spent on campus prior to registering for dissertation credit. Completion of 39 credits must be completed in residence.

It is strongly recommended that the applicant enroll on campus the first semester after admission, so that appropriate program planning can be completed.

Doctoral Residency

It is the responsibility of the student's doctoral committee to provide guidance, supervision, and review of the doctoral residency requirement. The purpose of residency is to provide the doctoral student with significant time for sustained contact with faculty members and intense attention to coursework, projects, research, and participation in academic life. Residency is a time for socialization into the shared community of professional life. It should include opportunities for the student to engage in activities outside of coursework that serve to transition the student into the new role of future colleague.

Each student's residency experience should be considered on an individual basis and should include many varied activities. Quality of participation is important, but so is variety. Experiences that meet the goals of the residency requirement may include such opportunities as:

1. Collaborative research or grants with faculty or peers
2. Working with faculty on scholarly publications
3. Participation in non course-related scholarly groups (e.g., book or writing groups)
4. College teaching internships or assistantships
5. Research assistantships
6. Attendance at local, regional, or national professional meetings
7. Involvement in graduate student organizations (e.g., Graduate Student Senate)
8. Committee and/or service work within the department, college, or university
9. Assisting faculty with course development and teaching

10. Advanced coursework beyond the minimum
11. Attendance at departmental colloquia
12. Considerable out-of-class interaction with faculty and/or students, especially on substantive issues
13. Organizing program events, such as brown bags, consortia, orientation programs, etc.

It is difficult to accomplish these outcomes while physically distant from the campus. Thus, doctoral programs nationwide include "residency" requirements to assure that doctoral students, upon graduation, will be prepared for full professional participation in academic life.

Research

Each student must complete a significant research study; present at a professional conference; and prepare an article for publication in an appropriate journal, based on the completed research and/or program of study.

Financial Assistance

Students should contact department heads for all inquiries regarding assistantships and tuition waivers. Applications for University assistantships, fellowships, and all financial aid are processed through department offices. For a listing of fellowships and scholarships, see the *Graduate Financial Assistance* section of this catalog (pages 92-93).

Career Opportunities

The doctoral specialization prepares educational leaders for positions as college and university researchers and teachers in education and education-related fields. Recipients of the doctorate degree are also prepared to conduct and direct research and development activities in public or private educational agencies or in the corporate sector; teach in community colleges, four-year colleges, and universities; serve as supervisors and curriculum specialists in public or private educational institutions and settings; and serve in a variety of other careers.

Administrative/Supervisory Certificate Program

A doctorate in education is separate from the Administrative/Supervisory Certificate (A/SC) Program; however, a student may obtain the A/SC while pursuing the doctorate degree. Completion of the A/SC program qualifies a person for the certificate required of administrators and/or supervisors at any level in the public school systems of Utah. Students desiring an Administrative/Supervisory Certificate may need to take courses in addition to those required for the PhD and EdD degree.

College of Education and Human Services Courses

Education courses are listed under the EDUC prefix, pages 497-498

Department of Electrical and Computer Engineering

Department Head: Tamal Bose
Location: Engineering Laboratory 149
Phone: (435) 797-2840
FAX: (435) 797-3054
E-mail: info@ece.usu.edu
WWW: http://www.ece.usu.edu

Undergraduate Advising:

Engineering Advising Center, Engineering 314A, (435) 797-2705,
kathy@engineering.usu.edu, ronnie@engineering.usu.edu,
sophie@engineering.usu.edu

Graduate Program Coordinator:

Scott E. Budge, Engineering Laboratory 113, (435) 797-3433,
scott.budge@ece.usu.edu

Degrees offered: Bachelor of Science (BS), Master of Engineering (ME), Master of Science (MS), Electrical Engineer (EE), and Doctor of Philosophy (PhD) in Electrical Engineering; BS in Computer Engineering

Undergraduate Programs

Department Mission Statement

The mission of the Electrical and Computer Engineering (ECE) Department is to develop students into outstanding electrical and computer engineers. The department is dedicated to superb teaching, research, and service.

Program Descriptions

The ECE Department offers a balanced curriculum of classwork, laboratory work, and design experiences to prepare students for careers in engineering. The Bachelor of Science programs in Electrical Engineering and Computer Engineering are accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (EAC/ABET). The research program of the department, which includes undergraduates as well as graduate students, is internationally acclaimed in the fields of aerospace instrumentation and measurements, image compression, communications, electromagnetics, controls, and robotics.

Electrical Engineering

The Electrical Engineering program is dedicated to producing engineers who: (1) contribute to engineering practice, advance engineering knowledge, and contribute to the good of society; (2) are advancing their education in engineering and other professions; and (3) take a leadership role in engineering and society.

Each student is given a solid foundation in electricity, electronics, signals, and systems, with individual practical experience. Upon this basic foundation, the students then build expertise in advanced areas, stressing actual design practice, to prepare them for productive engineering careers. The focus areas can be categorized into the following: analog and digital electronics, controls, signal processing, communications, electromagnetics, microwaves, and space systems.

Computer Engineering

The Computer Engineering program is dedicated to producing engineers who: (1) apply fundamental principles to solve practical

engineering problems; (2) are continually engaged in professional, personal, and community development; (3) are implementing well-planned, top-down designs of complex systems; and (4) function well as team members and interact well with other professionals and nonengineers.

Building on a solid curriculum in computing hardware and software, the program begins with a strong foundation in electricity, digital logic design, and computer science, then leads into advanced software engineering and microcomputer systems. Advanced courses provide experience in formal design methods, high-performance architectures, data communications, concurrent programming, and real-time and embedded systems. Students are also required to complete advanced course sequences in computer science.

Students in the BS programs in both electrical engineering and computer engineering are permitted and encouraged to take courses in the other program. Many courses, such as controls, digital signal processing, and robotics, draw heavily on skills in both areas.

Assessment

In addition to the regular national accreditation, the ECE Department employs a number of means to assess the quality of departmental programs. The primary indicator is the success of ECE graduates in obtaining professional employment. At several intervals following graduation, the department keeps track of student placement. Other major tools include annual quantitative assessment of program objectives, semi-annual reviews of the curriculum and facilities by the ECE Industrial Advisory Board, interviews of undergraduate and graduate students upon completion of their programs, regular monitoring of faculty members by peers, and periodic surveys of ECE graduates working in industry.

Requirements

Prior to entry into the upper-division classes, the student must meet the standards for entry into the Professional Engineering Program. Additional information concerning these items is given in the College of Engineering write-up (pages 112-113). It is the responsibility of students to be aware of these rules and procedures; however, advisor assistance is available.

Admission to Pre-Professional Program

Admission requirements for students desiring to major in Electrical Engineering or Computer Engineering are the same as those governing admission to the College of Engineering (see page 111), *except* that students must also be "calculus ready." That is, they must: (1) achieve a score of 27 or higher on the math ACT test; (2) complete MATH 1050 and 1060 *or* MATH 1210; or (3) achieve an AP score of at least 3 on the AB Calculus or BC Calculus test.

Bachelor of Science in Electrical Engineering

The program leading to a Bachelor of Science degree in electrical engineering is nominally a four-year program. The required program consists of a basic foundation of mathematics, science, computer science, engineering fundamentals, and laboratory and design experiences. Elective courses providing for one or more areas of technical focus, communication skills, and University Studies complete the program and prepare students for productive and rewarding careers in the electrical engineering profession.

Department of Electrical and Computer Engineering

Bachelor of Science in Computer Engineering

The program leading to a Bachelor of Science in computer engineering is nominally a four-year program. The required program consists of a basic foundation of mathematics, science, computer science, engineering fundamentals, and laboratory and design experiences. Elective courses providing for one or more areas of technical focus, communication skills, and University Studies complete the program and prepare students for productive and rewarding careers in the computer engineering profession.

Required Courses

Required courses are shown in the accompanying paragraphs; however, because of differences in high school or transfer student preparation, it is strongly recommended that students meet with the college academic advisor to plan a detailed semester-by-semester schedule for completing the preprofessional requirements. Particular attention must be paid to course prerequisites, requiring some students to take longer than four semesters to complete the preprofessional program. Students transferring into the department should consult with the college academic advisor for transfer credit evaluation and proper placement in the curriculum.

AP and CLEP credit may be used to meet some of the required technical and University Studies courses. Details concerning courses acceptable as electives are available from the Electrical and Computer Engineering Department.

Electrical Engineering

Pre-professional Program*

Suggested Semester Schedule

Freshman Year (30 credits)

Fall Semester (15 credits)

MATH 1210 (QL) Calculus I	4
CS 1700 Introduction to Computer Science—CS 1	3
ECE 1010 Introduction to Electrical and Computer Engineering.....	2
University Studies Breadth Courses.....	6

Spring Semester (15 credits)

MATH 1220 (QL) Calculus II	4
CS 1720 (QI) Introduction to Computer Science—CS 2	3
PHYX 2210 (QI) General Physics—Science and Engineering I.....	4
ECE 2530 Digital Circuits	4

Sophomore Year (33 credits)

Fall Semester (16 credits)

MATH 2210 (QI) Multivariable Calculus	3
PHYX 2220 (BPS/QI) General Physics—Science and Engineering II ..	4
University Studies Breadth Courses.....	9

Spring Semester (17 credits)

MATH 2250 (QI) Linear Algebra and Differential Equations.....	4
ECE 2410 Electrical Circuits	4
ENGL 2010 (CL) Intermediate Writing: Research Writing in a Persuasive Mode.....	3
Technical Elective Course	3
University Studies Depth Course (DSS).....	3

*All classes listed above with specific prefixes and course numbers are required for admission to the Professional Engineering Program (PEP). Courses are listed under the semesters in which they best fit.

Professional Program

Because of the variations in schedules, it is recommended that students meet with an advisor to work out a schedule for their junior

and senior years. The following courses are required for students selecting the **Professional Program in Electrical Engineering**.

Suggested Semester Schedule

Junior Year (31 credits)¹

Fall Semester (16 credits)

ECE 3410 Microelectronics I	4
ECE 3620 Circuits and Signals	3
ECE 3870 Electromagnetics I	3
ECE 5530 Digital System Design	3
MATH 5710 Introduction to Probability.....	3

Spring Semester (15 credits)

ECE 3640 Signals and Systems	3
ECE 3710 Microcomputer Hardware and Software	4
ECE 3820 Design I.....	2
Math/Science Elective Course	3
ECE Elective Course	3

Senior Year (31-32 credits)

Fall Semester (15 credits)

ECE 4840 (CI) Design II.....	3
PHYX 2710 Introductory Modern Physics	3
ECE Elective Courses	9

Spring Semester (16-17 credits)

ECE 4850 (CI) Design III	2
ECE Elective Courses	9
Technical Elective Course	3
University Studies Depth Course (DHA)	2-3

¹Some of the junior classes can be delayed until the senior year, but this may limit a student's choice of electives during his or her senior year.

Technical Elective Courses (select 30 or more credits)

Electrical Engineering Electives (select 21-27 credits)

ECE 3720 Microcomputer Systems Programming.....	3
ECE 4740 Computer and Data Communications	3

Also, any ECE 5000-level course (including ECE 5930 when topic relates to electrical engineering) may be counted as an Electrical Engineering Elective.

Math and Science Electives (select 3-9 credits)

MATH 3310 Discrete Mathematics (F,Sp,Su).....	3
MATH 4200 (CI) Foundations of Analysis (F,Sp).....	3
MATH 4310 (CI) Introduction to Algebraic Structures (F,Sp).....	3
MATH 4630 Computer Aided Math for Scientists and Engineers (Sp) ..	3
MATH 5210 Introduction to Analysis I (F).....	3
MATH 5220 Introduction to Analysis II (Sp).....	3
MATH 5270 Complex Variables (Sp).....	3
MATH 5310 Introduction to Modern Algebra (Sp)	3
MATH 5340 Theory of Linear Algebra (Sp)	3
MATH 5420 Partial Differential Equations (Sp)	3
MATH 5460 Introduction to the Theory and Application of Nonlinear Dynamical Systems (Sp)	3
MATH 5510 Introduction to Topology (F).....	3
MATH 5610 Computational Linear Algebra and Solution of Systems of Equations (Sp).....	3
MATH 5620 Numerical Solution of Differential Equations (Sp)	3
MATH 5720 Introduction to Mathematical Statistics (Sp).....	3
MATH 5760 Stochastic Processes (F)	3
AP Biology	4
BIOL 1210 Biology I (F).....	4
BIOL 2000 Human Physiology (F,Sp,Su)	4
BIOL 3300 General Microbiology (F,Sp)	4

Department of Electrical and Computer Engineering

AP Chemistry.....	8
CHEM 1210 Principles of Chemistry I (F,Sp)	4
CHEM 1220 (BPS) Principles of Chemistry II (F,Sp,Su)	4
CHEM 1230 Chemical Principles Laboratory I (F,Sp)	1
CHEM 2310 Organic Chemistry I (F)	4
CHEM 3700 Introductory Biochemistry (Sp)	3
CHEM 3710 Introductory Biochemistry Laboratory (Sp)	1
FRWS 2200 (BLS) Ecology of Our Changing World (F,Sp)	3
PHYX 3550² Intermediate Classical Mechanics.....	3
PHYX 3600 Intermediate Electromagnetism.....	3
PHYX 3700³ Thermal Physics.....	3
PHYX 3750 Foundations of Wave Phenomena	3
PHYX 4550 Advanced Classical Mechanics	3
PHYX 4600 Advanced Electromagnetism	3
PHYX 4650 Optics I (F).....	3
PHYX 4680 Optics II (Sp).....	3
PHYX 4700 Quantum Mechanics I.....	3
PHYX 4710 Quantum Mechanics II.....	3

Technical Electives (select 0-6 credits)

CS 2200 (QI) Algorithms and Data Structures—CS 3 (F,Sp,Su).....	3
CS 2370 (CI) Software Engineering (F,Sp)	3
CS 3100 Operating Systems and Concurrency (F,Sp).....	3
CS 3550 Computer Architecture (F,Sp)	3
CS 4700 Programming Languages (F,Sp)	3
CS 5000 Theory of Computability (Sp).....	3
CS 5050 Advanced Algorithms (F,Sp)	3
CS 5100 Graphical User Interfaces and Windows Programming (Sp)..	4
CS 5200 Distributed and Network Programming (F).....	4
CS 5300 Compiler Construction (F)	4
CS 5370 Advanced Software Engineering (F).....	3
CS 5400 Computer Graphics I (F).....	4
CS 5450 Multimedia Systems (Sp)	4
CS 5500 Parallel Algorithms (Sp).....	3
CS 5600 AI: Problem Solving and Expert Systems (F)	3
CS 5650 CVPRIP I: Computer Vision, Pattern Recognition, and Image Processing (F).....	3
CS 5700 Object-Oriented Software Development (F)	3
CS 5800 Introduction to Database Systems (F).....	3
CS 5850 Systems Analysis (Sp).....	3
CEE 4200 Engineering Economics (F).....	2
ECE 3260 (QI) Science of Sound (F)	3
ECE 4250 Internship/Co-op (F,Sp,Su)	3
ENGR 2000 Engineering Mechanics Statics (F,Sp)	2
ENGR 2020 Engineering Mechanics Dynamics (F,Sp)	3
ENGR 2040 Strength of Materials (F,Sp)	2
ENGR 5500 High Performance Computing for Engineers (F).....	3
MAE 2060 Material Science (F,Sp)	3
MAE 2400 Thermodynamics I (Sp,Su).....	3

²Students cannot receive credit for both Engineering Mechanics *and* Analytical Mechanics.
³Students cannot receive credit for both Engineering Thermodynamics *and* Thermal Physics.

Computer Engineering

Pre-professional Program**

Suggested Semester Schedule

Freshman Year (30-31 credits)

Fall Semester (15-16 credits)

MATH 1210 (QL) Calculus I	4
CS 1700 Introduction to Computer Science—CS 1	3
CS 1710⁴ Introduction to Computer Science—CS 1 Lab	(1)
ECE 1010 Introduction to Electrical and Computer Engineering.....	2
University Studies Breadth Courses.....	6

Spring Semester (15 credits)

MATH 1220 (QL) Calculus II	4
CS 1720 (QI) Introduction to Computer Science—CS 2	3
PHYX 2210 (QI) General Physics—Science and Engineering I.....	4
ECE 2530 Digital Circuits	4

Sophomore Year (33-34 credits)

Fall Semester (17 credits)

ENGL 2010 (CL) Intermediate Writing: Research Writing in a Persuasive Mode.....	3
CS 2200 (QI) Algorithms and Data Structures—CS 3.....	3
MATH 2250 (QI) Linear Algebra and Differential Equations.....	4
PHYX 2220 (BPS/QI) General Physics—Science and Engineering II ..	4
University Studies Breadth Course	3

Spring Semester (16-17 credits)

MATH 3310 Discrete Mathematics.....	3
ECE 2410 Electrical Circuits	4
CS 2370 (CI) Software Engineering	3
Technical Elective Course	3-4
University Studies Breadth Course	3

⁴Students desiring a Computer Science minor must take CS 1710 as a freshman. The rest of the minor is built into the curriculum. This lab is *not required* for the Computer Engineering major.

**All classes listed above with specific prefixes and course numbers (*except* for CS 1710 and CS 2370) are required for admission to the Professional Engineering Program (PEP). Courses are listed under the semesters in which they best fit.

Professional Program

Suggested Semester Schedule

Because of the variation in schedules, it is recommended that students meet with an advisor to work out a schedule for their junior and senior years. The following courses are required for students selecting the Professional Program in Computer Engineering.

Suggested Semester Schedule

Junior Year (32 credits)⁵

Fall Semester (15 credits)

ECE 3410 Microelectronics I	4
ECE 3620 Circuits and Signals	3
ECE 3710 Microcomputer Hardware and Software	4
ECE 3860 Transmission Lines	1
ECE 5530 Digital System Design	3

Spring Semester (17 credits)

CS 3100 Operating Systems and Concurrency	3
ECE 3640 Signals and Systems	3
ECE 3720 Microcomputer Systems Programming.....	3
ECE 3820 Design I.....	2
MATH 5710 Introduction to Probability.....	3
University Studies Breadth Course	3

Senior Year (30-31 credits)

Fall Semester (15-16 credits)

ECE 4740 Computer and Data Communications.....	3
ECE 4840 (CI) Design II.....	3
Computer Science Elective Course.....	4
Computer Engineering Elective Course	3
University Studies Depth Course (DHA)	2-3

Spring Semester (15 credits)

ECE 4850 (CI) Design III.....	2
High-Level Technical Elective Courses	7
Math/Science Elective Course	3
University Studies Depth Course (DSS).....	3

⁵Some of the junior classes can be delayed until the senior year, but this may limit a student's choice of electives during his or her senior year.

Department of Electrical and Computer Engineering

High-Level Technical Elective Courses

(select 14-19 credits)

Students must complete a total of *at least* 14 credits within high-level technical electives. Courses listed in this departmental section as Computer Engineering Electives or Computer Science Electives may be used to fulfill this requirement. Also, courses having an ECE or CS prefix, which are numbered at the 5000 level, may be used as high-level technical electives.

Technical Elective Courses (select 22 or more credits)

Computer Engineering Electives (select 3-15 credits)

ECE 5320	Mechatronics (Sp)	4
ECE 5640	Real-Time Processors (Sp)	4
ECE 5740	Concurrent Programming (F)	3
ECE 5750	High-Performance Microprocessor Architecture (Sp)	3
ECE 5770	Microcomputer Interfacing (Sp)	4
ECE 5780	Real-Time Systems (F)	4

Computer Science Electives (select 4-12 credits)

CS 5100	Graphical User Interfaces and Windows Programming (Sp)	4
CS 5200	Distributed and Network Programming (F)	4
CS 5400	Computer Graphics I (F)	4

Math and Science Electives (select 3-9 credits)

MATH 2210 (QI)	Multivariable Calculus (F,Sp,Su)	3
MATH 4200 (CI)	Foundations of Analysis (F,Sp)	3
MATH 4310 (CI)	Introduction to Algebraic Structures (Sp)	3
MATH 4630	Computer Aided Math for Scientists and Engineers (Sp)	3
MATH 5210	Introduction to Analysis I (F)	3
MATH 5220	Introduction to Analysis II (Sp)	3
MATH 5270	Complex Variables (Sp)	3
MATH 5310	Introduction to Modern Algebra (Sp)	3
MATH 5340	Theory of Linear Algebra (Sp)	3
MATH 5420	Partial Differential Equations (Sp)	3
MATH 5460	Introduction to the Theory and Application of Nonlinear Dynamical Systems (Sp)	3
MATH 5510	Introduction to Topology (F)	3
MATH 5610	Computational Linear Algebra and Solution of Systems of Equations (F)	3
MATH 5620	Numerical Solution of Differential Equations (Sp)	3
MATH 5720	Introduction to Mathematical Statistics (Sp)	3
MATH 5760	Stochastic Processes (F)	3
AP Biology		4
BIOL 1210	Biology I (F)	4
BIOL 2000	Human Physiology (F,Sp,Su)	4
BIOL 3300	General Microbiology (F,Sp)	4
AP Chemistry		8
CHEM 1210	Principles of Chemistry I (F,Sp)	4
CHEM 1220 (BPS)	Principles of Chemistry II (F,Sp,Su)	4
CHEM 1230	Chemical Principles Laboratory I (F,Sp)	1
CHEM 2310	Organic Chemistry I (F)	4
CHEM 3700	Introductory Biochemistry (Sp)	3
CHEM 3710	Introductory Biochemistry Laboratory (Sp)	1
FRWS 2200 (BLS)	Ecology of Our Changing World (F,Sp)	3
PHYX 2710	Introductory Modern Physics	3
PHYX 3550 ⁶	Intermediate Classical Mechanics	3
PHYX 3600	Intermediate Electromagnetism	3
PHYX 3700 ⁷	Thermal Physics	3
PHYX 3750	Foundations of Wave Phenomena	3
PHYX 4550	Advanced Classical Mechanics	3
PHYX 4600	Advanced Electromagnetism	3
PHYX 4650	Optics I	3
PHYX 4680	Optics II	3
PHYX 4700	Quantum Mechanics I	3
PHYX 4710	Quantum Mechanics II	3

Technical Electives (select 0-8 credits)

CS 3550	Computer Architecture (F,Sp)	3
CS 4700	Programming Languages (F,Sp)	3
CEE 4200	Engineering Economics (F)	2
ECE 4250	Internship/Co-op (F,Sp,Su)	3
ECE 5310	Control Systems (F)	3
ENGR 2000	Engineering Mechanics Statics (F,Sp)	2
ENGR 2020	Engineering Mechanics Dynamics (F,Sp)	3
ENGR 2040	Strength of Materials (F,Sp)	2
MAE 2060	Material Science (F,Sp)	3
MAE 2400	Thermodynamics I (Sp,Su)	3
ENGR 5500	High Performance Computing for Engineers (F)	3

Any upper-division (3000, 4000, or 5000 level) ECE class not required by the major may also be used as a Technical Elective course.

However, specific courses must be approved in writing before the student registers for the course.

⁶Students cannot receive credit for both Engineering Mechanics and Physics Mechanics.

⁷Students cannot receive credit for both Engineering Thermodynamics and Physics Thermodynamics.

Minors

Students should have all minors approved by the minor department. Minors may be filled by using the Technical Electives credits for courses in the chosen minor area. All courses required for the minors must be completed with grades of C- or better.

Mathematics Minor

Required courses include:

MATH 1210 (QL)	Calculus I (F,Sp,Su)	4
MATH 1220 (QL)	Calculus II (F,Sp,Su)	4
MATH 2210 (QI)	Multivariable Calculus (F,Sp,Su)	3
MATH 2270 (QI)	Linear Algebra (F)	3
MATH 2280 (QI)	Ordinary Differential Equations (Sp)	3

Two additional courses (6 credits) numbered above 4000, excluding MATH 4300, 4400, 4500, 4620, 5570, and 5580, are also required. MATH 2250 may substitute for MATH 2270 and 2280.

Physics Minor

PHYX 2210 (QI)	General Physics—Science and Engineering I	4
PHYX 2220 (BPS/QI)	General Physics—Science and Engineering II	4

Students must also select 10 credits from courses in Physics numbered 2710 or above.

Computer Science Minor

A minimum of 16 credits (with a cumulative GPA of 2.5 or higher and a C- or better in each class) is required. Students must complete the following courses:

CS 1700	Introduction to Computer Science—CS 1 (F,Sp,Su)	3
CS 1710	Introduction to Computer Science—CS 1 Lab (F,Sp,Su)	1
CS 1720 (QI)	Introduction to Computer Science—CS 2 (F,Sp,Su)	3
CS 2200 (QI)	Algorithms and Data Structures—CS 3 (F,Sp,Su)	3

Students must also complete two additional computer science classes. One of these two classes must be numbered at the 3000 level or above. Students should contact the Computer Science Department for information about classes that may not be used toward the Computer Science Minor.

Other minors should be approved by the minor department.

Department of Electrical and Computer Engineering

Student Research Opportunities

Undergraduate students are extensively involved with research activities in the department. Electrical engineering majors and computer engineering majors have presented papers at research conferences and have won prizes. They have also designed satellites for deployment from the space shuttle. Electrical and Computer Engineering faculty members are dedicated to helping students and providing a challenging and interesting learning atmosphere. For additional information, see the *Research* section under *Graduate Programs* (page 230).

Departmental Honors

Students who would like to experience greater academic depth within their major are encouraged to enroll in departmental honors. Through original, independent work, Honors students enjoy the benefits of close supervision and mentoring, as they work one-on-one with faculty in select upper-division departmental courses. Honors students also complete a senior project, which provides another opportunity to collaborate with faculty on a problem that is significant, both personally and in the student's discipline. Participating in departmental honors enhances students' chances for obtaining fellowships and admission to graduate school. Minimum GPA requirements for participation in departmental honors vary by department, but usually fall within the range of 3.30-3.50. Students may enter the Honors Program at almost any stage in their academic career, including at the junior (and sometimes senior) level. The campus-wide Honors Program, which is open to all qualified students regardless of major, offers a rich array of cultural and social activities, special classes, and the benefit of Honors early registration. Interested students should contact the Honors Program, Merrill Library 374, (435) 797-2715, honors@cc.usu.edu. Additional information can be found online at: <http://www.usu.edu/honors/>

Financial Support

Scholarships, assistantships, grants-in-aid, and work-study programs are available through the University. In addition, the department employs undergraduate and graduate students to assist in engineering research and development.

Concurrent BS/Master's Program

The concurrent BS/Master's program allows engineering students to begin taking graduate-level classes during their senior year. This permits them to complete requirements for both the BS degree and the master's degree concurrently during two years. Students in this program have a greater selection of graduate courses, since many graduate courses are taught during alternate years. In addition, the student's senior design project could be a start for a graduate design project or thesis. After completing their BS degree, students in the program can earn a master's degree in only one additional year. Both the BS and the master's degree can generally be earned with 150 total credits. Finally, students with a master's degree can expect a much higher starting salary following graduation. The department requires that students have a minimum GPA of 3.3, in order to qualify for acceptance into the concurrent BS/Master's program. (For more information, see the *College of Engineering* section of this catalog, pages 113-114.)

Additional Information

For more information about Bachelor of Science requirements and the sequence in which courses should be taken, see major requirement sheet, available from the Electrical and Computer Engineering Department, or online at: <http://www.usu.edu/ats/majorsheets/>

Graduate Programs

Admission Requirements

See general admission requirements on pages 93-94. Applicants with a bachelor's degree in Electrical or Computer Engineering from an ABET accredited program and having a 3.1 GPA or better can generally be admitted without restriction. Additional coursework in electrical and computer engineering fundamentals may be required in individual cases. Students must take the general GRE exam; however, the subject GRE is not required. All graduate students are expected to have a working knowledge of a computer language (preferably C or C++).

Applications will be considered throughout the year. However, students desiring financial aid should submit application materials by January 1 to be considered for the following fall semester and July 1 to be considered for the following spring semester.

No applications will be considered until all required information arrives in the office of the School of Graduate Studies.

Degree Requirements

Specific requirements for the ME, MS, EE, and PhD degrees are outlined below; these are in addition to the general requirements of the School of Graduate Studies. All graduate degree programs in the ECE Department require a grade of *B-* or better in all courses applied toward the requirements listed below.

Master of Engineering (ME) and Master of Science (MS)

The ME degree is based on coursework and is designed to give graduates a strong practical foundation. The MS degree requires substantial thesis or project work in a specific area and prepares students for advanced study or advanced work in that area. The MS degree has two options. Under Plan A, the student completes a thesis. Under Plan B, the student prepares an engineering project report.

If a student chooses an MS degree, changing to the ME degree is only possible by approval of the major professor, ECE graduate committee, and the department head.

The MS and ME degrees require successful completion of 30 credits of 5000-level or above coursework in a program approved by the student's supervisory committee, with the following stipulations:

Master of Science

1. At least 12 credits of ECE coursework must be completed at or above the 6000 level.
2. MS Plan A students must complete 6 credits of Thesis Research (ECE 6970).
3. MS Plan B students must complete 3 credits of Thesis Research (ECE 6970) and 3 credits of Design Project (ECE 6950).

Department of Electrical and Computer Engineering

4. MS students must have a one- to two-page, double-spaced thesis or project proposal approved by their committee when a project has been identified.

Master of Engineering

1. At least 18 credits of ECE coursework must be completed at or above the 6000 level.
2. At least two ECE courses with substantial lab components must be completed at or above the 5000 level. This requirement may be waived for students who have taken two USU ECE lab intensive courses as undergraduates and who received a grade of B- or better in both of these classes.

All Master's Students

1. At least 3 credits of ECE coursework must be completed at the 7000 level.
2. One credit of ECE 6800 (Electrical Engineering Colloquium) must be completed as soon as possible.
3. Each master's student must form a committee and have a program of study approved by the end of his or her first semester.
4. No more than 10 credits of 5000-level coursework may be applied toward a master's degree.
5. Any exceptions to the master's requirements must be approved by the student's committee and the ECE Graduate Committee.

A course in technical and professional writing, or equivalent writing experience, is required for MS students prior to beginning the thesis. This may be fulfilled as a requirement for a bachelor's degree. MS students may, at the discretion of their supervisors, be required to hire an editor to bring the thesis or paper into acceptable form.

Electrical Engineer

The Electrical Engineer degree is awarded for the successful completion of an advanced program of 60 credits of academic work beyond the BS, or 30 credits beyond the MS, and a comprehensive engineering report earning an additional 10 credits. The degree requirements do not include a comprehensive examination, and the engineering report is given in lieu of the original research dissertation. The degree differs from the PhD by preparing the student for professional engineering work, rather than for research.

Doctor of Philosophy

To qualify for a PhD degree, a student is expected *either* to complete at least 51 credits beyond the requirements for a BS degree; *or* to complete at least 21 credits beyond the requirements for an MS degree, *plus* complete enough credits of dissertation research to have a total of 90 credits beyond the BS degree or 60 credits beyond the MS degree. Completion of this coursework generally requires three semesters of study beyond the MS degree, with up to 18 credits beyond the BS degree being taken in courses outside the Electrical and Computer Engineering Department.

After a student has completed at least 18 credits of coursework beyond the MS degree, he or she must pass a comprehensive examination based on graduate-level courses, as well as pass a dissertation research proposal defense. Near the end of the program, the results of the original (publishable) research work will be presented and publicly defended as a dissertation.

For further information, visit the departmental website at: <http://www.engineering.usu.edu/ece/>

Research

The department conducts extensive research through the following centers:

1. Center for Self-Organizing Intelligent Systems (CSOIS)
2. National Center for the Design of Molecular Function (NCDMF)
3. Space Dynamics Laboratory (SDL)
4. Anderson Center for Wireless Teaching and Research
5. Center for High-Speed Information Processing (CHIP)
6. Center for Advanced Imaging LADAR (CAIL)

Research activities include: robotics, control systems, digital system design, computer networks, concurrent systems, antennas, space systems, image processing, digital signal processing, wireless communications, acoustics, electromagnetic compatibility, and LADAR systems.

Financial Assistance

All applicants who are accepted academically are automatically considered for financial aid. Many successful graduate students in the department do receive some level of financial aid during their degree program.

Electrical and Computer Engineering Faculty

Professors

Doran J. Baker, electromagnetics, infrared measurements, engineering systems in space
Tamal Bose, digital signal processing, communications
Joe R. Doupnik, communications, computers
H. Scott Hinton, photonic switching, Dean of College of Engineering
Todd K. Moon, communications and signal processing
Linda S. Powers, biophysics, molecular engineering

Adjunct Professor

Heng-Da Cheng, pattern recognition, image processing

Trustee Professor Emeritus

Kay D. Baker, electronics, space science

Professors Emeritus

Robert W. Gunderson, control systems, pattern recognition, robotics
Ronney D. Harris, microwaves, transmission line circuits, atmospheric modeling
William L. Jones, integrated circuits
Alan W. Shaw, electromagnetics, controls, microcomputers
Allan J. Steed, electro-optics, aerospace measurement systems
Gardiner S. "Dyke" Stiles, concurrent systems
Ronald L. Thurgood, computers, database systems
Clair L. Wyatt, infrared, electro-optical systems

Department of Electrical and Computer Engineering

Associate Professors

Scott E. Budge, signal processing, image processing
Charles M. Swenson, space science and space engineering
Paul A. Wheeler, microprocessors, acoustics

Research Associate Professor

Robert T. Pack, geological and geomatics engineering

Adjunct Associate Professors

R. Rees Fullmer, control systems, space engineering
Ronald J. Huppi, space research
John C. Kemp, robotics, electro-optics
Tsung-Cheng Shen, physics
Gene A. Ware, computer systems

Associate Professor Emeritus

Duane G. Chadwick, remote sensors, instrumentation

Assistant Professors

Matthew D. Berkemeier, computers, robotics, controls
Annette Bunker, computer security, hardware verification
Yang Quan Chen, control systems
Aravind Dasu, computer engineering

Brandon K. Eames, computer engineering
Jacob H. Gunther, communications and signal processing
George K. Liang, electromagnetics
Michael W. Tompkins, electromagnetics
Chris Winstead, analog VLSI

Research Assistant Professor

Hui Fang Dou, precision instruments, mechatronics

Adjunct Research Assistant Professor

Steven R. Wassom, controls

Adjunct Assistant Professor

Charles R. Tolle, controls

Principal Lecturers

Paul D. Israelsen, integrative services, digital systems design
Randy J. Jost, electromagnetics, microwave engineering, solid state electronics

Course Descriptions

Electrical and Computer Engineering (ECE), pages 498-502

Department of Elementary Education

Department Head: Bernard L. Hayes
Location: Emma Eccles Jones Education 385A
Phone: (435) 797-0385
FAX: (435) 797-0372
E-mail: elemeduc@cc.usu.edu
WWW: <http://www.coe.usu.edu/eled/>

Student Teaching Director:
Katy Johnson, Education 371, (435) 797-0371,
katy.johnson@usu.edu

Undergraduate Advisors:
Susie Maughan, Education 383, (435) 797-0375,
susie.maughan@usu.edu
Sylvia Robinson, Education 377, (435) 797-0377,
sylvia.robinson@usu.edu
Dawn D. Black, Education 375, (435) 797-0383,
dawn.black@usu.edu

Degrees offered: Bachelor of Science (BS), Bachelor of Arts (BA), Master of Science (MS), Master of Arts (MA), and Master of Education (MEd) in Elementary Education; BS and BA in Early Childhood Education; the Elementary Education Department participates in the Interdepartmental Doctoral Program in Education, including Doctor of Education (EdD) and Doctor of Philosophy (PhD) with Curriculum and Instruction Specialization

Graduate specializations: MA, MS, MEd—Early Childhood Education; Educational Leadership; ESL Education; Gifted and Talented Education; Math and Science Education; Middle Education; Reading, Writing, and Language Arts; and Social Studies Education

Undergraduate Programs

Objectives

The purposes of the Department of Elementary Education are:

1. To develop professional educators;
2. To advance knowledge in the field of education.

These purposes are realized through teaching, scholarly activities, and service. The department provides leadership in the preparation of teachers, supervisors, curriculum specialists, and other professional personnel for careers in elementary education, early childhood education, and middle education.

The Department of Elementary Education at Utah State University offers eight programs leading to licensure as a teacher. In the following list, each program name is followed by the licensure obtained (shown in parentheses). (1) Elementary Education (grades 1 through 6); (2) Early Childhood Education (preschool through grade 3); (3) Dual Elementary and Early Childhood Education (preschool through grade 6); (4) Composite Elementary Education/Special Education—Mild/Moderate (grades 1 through 6 Special Education, and grades kindergarten through 12); (5) Composite Elementary Education/Special Education—Severe (grades 1 through 6 Special Education, and grades kindergarten through 12); (6) Composite Early Childhood Education/Special Education—Early Childhood (preschool through grade 3, and Special Education birth through age 5); (7) Composite Elementary Education/Deaf Education (grades 1-6, and master's in Deaf Education); (8) Composite Early Childhood Education/Deaf Education (preschool through grade 3, and master's in Deaf Education).

Undergraduate Research

Undergraduate research opportunities are available with many departmental faculty members. Interested students should contact Francine Johnson, associate dean in the College of Education and Human Services, (435) 797-2417, francine.johnson@usu.edu.

Assessment

To review Department of Elementary Education assessment information, visit <http://www.coe.usu.edu/eled/> and click on the assessment link.

University Studies Requirements

Elementary Education Majors and Early Childhood Education Majors are required to take certain classes to fulfill the University Studies requirements. The following sections list the specific courses to choose from:

Computer and Information Literacy (0-3 credits)

Passing grade on six computer and information literacy related examinations. Although no specific course is required, USU 1000 and BIS 1400 teach the required skills.

Quantitative Literacy (QL) (3 credits)

(A grade lower than a C- will not be accepted in this course.)

STAT 1040 (QL) Introduction to Statistics 3
(MATH 1050 or Math ACT score of 25 or higher is required to apply to the Teacher Education Program.)

Breadth Requirements (21 credits)

Choose one course from the following to meet BAI requirement:

ECON 1500, HIST 1700, POLS 1100, USU 1300 3

Choose one course from the following to meet BCA requirement:

MUSC 1010, USU 1330 3

Choose one course from the following to meet BHU requirement:

ANTH 1710, HIST 1030, HIST 1050, PHIL 1010, PHIL 1200,
PHIL 2400, PHIL 2500, USU 1320 3

Choose one course from the following to meet BSS requirement:

ANTH 1010, ANTH 2100, ASTE 2900, ENVS 2340, GEOG 1030,
GEOG 2030, JCOM 1000, NR 1010, POLS 2200, SOC 1010,
USU 1340 3

Choose one course from the following to meet BLS requirement:

AWER 1200, BIOL 1010, FRWS 2200, NFS 1020, PLSC 2100,
USU 1350 3

Choose two courses from the following to meet BPS requirement:

BMET 2000, GEOG 1130, GEOL 1100, GEOL 1150, CHEM 1010,
PHYX 1000, PHYX 1200, SOIL 2000, USU 1360 6

Depth Education Requirements

Communications Intensive (CI) (2 courses) (included in major)

ELED 3000 (CI) Foundation Studies and Practicum in Teaching and Classroom Management Level II (F, Sp) 6-8

ELED 4030 (CI) Teaching Language Arts and Practicum Level III (F, Sp, Su) 3

Quantitative Intensive (QI) (1 course)

(A grade lower than a C- will not be accepted in this course.)

MATH 2020 (QI)¹ Introduction to Logic and Geometry (F, Sp, Su) 3

Department of Elementary Education

Depth Course Requirements (2 courses)

Choose two approved University Studies depth courses designated DSC, DHA, or DSS (outside of area of Emphasis).

¹Prerequisite: MATH 1050 or Math ACT score of 25 or higher (also required to apply to the Teacher Education Program).

Requirements

Provisional Admission Process and Requirements

Since more students major in Elementary Education at USU than in any other major, competition for admission into the program is very keen. Due to increased demands for admission, coupled with limited resources, a ceiling of 175 students has been placed on admissions each year. Thus, admission to USU does not necessarily guarantee admission into the Elementary Education Program.

Provisional admission to the Elementary and Early Childhood Teacher Education Program is determined by (1) the student's GPA in a set of core courses, (2) ACT scores and Writing Diagnostic Test or PPST test results, (3) the number of credits a student has taken, (4) successful completion of a group assessment interview, and (5) a speech and hearing test. (Additional factors to be weighted may be gender and/or minority status consistent with applicable law.) Applications are accepted each semester. Because there are typically more applicants than there is space available, the number accepted is limited. **Students who are not accepted may reapply.** Provisional admission requires formal action by the Office of the Dean of the College of Education and Human Services, as well as by the student's department.

Admission to the Teacher Education Program is a prerequisite for enrollment in the major, starting with Level II. A student desiring admission to the Teacher Education Program should file an application in the Elementary Education Office, located in room 373 of the Emma Eccles Jones Education Building.

Elementary Education SODIA Program

The acronym SODIA represents the elementary Teacher Education Program. The name is derived from the initial letter of descriptive words (Self, Others, Discipline, Implementation, and Application) which represent emphasis placed at each level of the program.

The elementary education SODIA program is performance-based and field-centered. It utilizes public schools as partners in each phase of the Teacher Education Program. SODIA is an interdisciplinary and interdepartmental program utilizing staff members from the Departments of Psychology; Special Education and Rehabilitation; Family, Consumer, and Human Development; Health, Physical Education and Recreation; Music; Art; Theatre Arts; and Instructional Technology who work in conjunction with the Department of Elementary Education. These University faculty members work with teachers and principals of cooperating public schools and the Edith Bowen Laboratory School on the USU campus in an integrated program.

Level I, Self, is represented by the "S" in the acronym SODIA. This is the first-level course (ELED 1000) introducing the field of education and emphasizing the student's self-assessment in relation to ability and desire to teach. A minimum of 15 hours are spent observing in an elementary or middle school classroom, completing volunteer service in other community settings, and viewing a variety of selected professional videos. In addition, a human growth and development course is required. The two courses in Level I are prerequisites to applying to the Teacher Education Program.

Level II, Others, is represented by the "O" in the acronym SODIA. This stands for the many "others" who make up the education community. In this bloc, each student receives 15 credits and is assigned as a teacher assistant in one of the public schools. The remainder of the time is spent in seminars and classwork offered on the USU campus. The classwork is interdisciplinary and interrelated, including courses in elementary education, psychology, special education, and technology. Entrance to Level II requires prior admission to the Teacher Education Program.

Level III, Disciplines, is represented by the "D" in the acronym SODIA. Students in this bloc complete 15 credits of methods coursework and practica at the Edith Bowen Laboratory School or public schools. The "methods" courses in reading, social studies, language arts, mathematics, and science are included in this bloc. A preliminary course in reading is required as a transition from Level II to Level III.

Level IV, Implementation, is represented by the "I" in the acronym SODIA. This is the student teaching or internship phase of the program. Student teaching constitutes full days of actual teaching experience for the entire semester. Internships are for the entire academic year.

Level V, Application, is represented by the "A" in the acronym SODIA. At this level, graduates of the program make a transition into the profession of teaching.

National INTASC Principles also receive major emphasis through SODIA's levels of progression. These principles are: Content Pedagogy, Student Development, Diverse Learners, Critical Thinking, Motivation and Management, Communication, Planning, Assessment, Professional Development, and School/Community Development. A student performance portfolio process (based around the INTASC Principles) is also included.

Continuing Status Requirements

A minimum GPA of 2.75 is required to remain in good standing and to graduate from the program.

All students majoring in elementary education must be registered in the College of Education and Human Services. An advisor will be assigned from the Department of Elementary Education. Programs of professional education courses, as well as teaching support courses and an area of emphasis, have been developed by the Department of Elementary Education and approved by the Council on Teacher Education and the Utah State Office of Education. For a complete description of the program and requirements for graduation and licensure, students should visit the Elementary Education Department website: <http://www.coe.usu.edu/eled/>

Each student completes a professional semester of student teaching or a year of internship. An application for student teaching/internship must be made at least one semester in advance, and credentials are reevaluated at that time. Not all student teachers/interns can be accommodated by the schools located within Cache Valley. Students should be financially prepared to spend that time off campus in the event such an arrangement is necessary. Students must be responsible for their own transportation.

Students who carefully select their elective courses may also qualify for a special endorsement to the basic professional teaching license. All students complete an area of emphasis in a subject matter field, in addition to the teaching support courses. Information concerning special endorsements and additional areas of specialization may be obtained from the Department of Elementary Education.

Department of Elementary Education

Students who have teaching licenses in areas other than elementary education may obtain the elementary license by meeting the same or equivalent requirements for licensure expected of an elementary education major. Those desiring to acquire a dual license should work with an advisor from the Department of Elementary Education.

All courses listed as major subject courses must be taken on an A-B-C-D-F basis and the grade point average for these courses must be 2.75 or better. Major subject courses passed with less than a C grade must be repeated.

Course Requirements

Elementary Education Major (77-80 credits) (includes Teaching Support Courses and Emphasis)

Students majoring in Elementary Education should complete all the following courses as indicated.

Note: Teaching License requires 2.75 cumulative Grade Point Average (GPA). (Grades lower than a C will not be accepted in the major.)

Level I (6 credits)

ELED 1000 Orientation to Elementary Education (F,Sp,Su)	3
FCHD 1500 (BSS) Human Development Across the Lifespan (F,Sp) ...	3

Level II (18 credits) (courses taken concurrently)

Students must be admitted to the Teacher Education Program prior to taking these classes.

ELED 3000 (CI) Foundation Studies and Practicum in Teaching and Classroom Management Level II (F,Sp)	8
SPED 4000 Education of Exceptional Individuals (F,Sp,Su)	2
PSY 3660 Educational Psychology for Teachers (F,Sp)	2
INST 4010 Principles and Practices of Technology for Elementary Teachers (F,Sp,Su)	3
ELED 3100 ² Teaching Reading I (F,Sp,Su)	3

²ELED 3100 may be taken after Level II, but before Level III.

Level III (15 credits; must follow Level II) (courses taken concurrently)

ELED 4000 Teaching Science and Practicum Level III (F,Sp,Su)	3
ELED 4030 (CI) Teaching Language Arts and Practicum Level III (F,Sp,Su)	3
ELED 4040 (CI) Teaching Reading II and Practicum Level III (F,Sp,Su)	3
ELED 4050 Teaching Social Studies and Practicum Level III (F,Sp,Su)	3
ELED 4060 Teaching Mathematics and Practicum Level III (F,Sp,Su) ..	3

Level IV (15 credits; must follow Level III)

ELED 5100 Student Teaching—Primary Grades (1-3) (F,Sp)	6
ELED 5150 Student Teaching—Elementary (Grades 4-6) (F,Sp)	6
ELED 5250 Student Teaching—Seminar (F,Sp)	3

Teaching Support Courses (11-14 credits) (Grade of C- or better is required.)

Required Courses (5 credits)	
MUSC 3260 Elementary School Music (F,Sp,Su)	2
PEP 3050 Physical Education in the Elementary School (F,Sp,Su)	3

Teaching Support Electives

(3 courses, for a total of 6-9 credits)

Choose one course from the following:

HEP 2000 First Aid and Emergency Care (F,Sp)	2
HEP 2500 Health and Wellness (F,Sp,Su)	2
HEP 3000 Drugs and Human Behavior (F,Su)	3
HEP 3500 Elementary School Health Education (F,Sp)	2

Choose two courses from the following:

ART 3700 Elementary Art Methods (F,Sp)	3
ELED 4410 Gifted Education in the Regular Classroom (F)	3
ELED 4420 Multiple Talent Approach to Thinking (Su)	2
ELED 4480 Early Childhood Education Kindergarten through Grade 3 (F, Sp)	3
ELED 4710 Diversity in Education (F,Sp)	3
ENGL 3530 Children's Literature (Sp)	3
ENVS 5110 Environmental Education (Sp)	3
FCHD 2610 Parenting and Child Guidance (F,Sp)	3
LING 4100 The Study of Language (F,Sp)	3
LING 4900 Analysis of Cross-Cultural Difference (Sp)	3
THEA 4030 Storytelling (F,Sp,Su)	3
THEA 4330 Drama and Theatre for Youth: Grades K-6 (F,Sp,Su)	3

Emphasis (12 credits) (C- or better required)

Refer to the next page for a listing of available Emphasis areas. For a listing of required and recommended courses, students should contact their advisor.

Early Childhood Education Major (80 credits) or Early Childhood and Elementary Education Dual Major (90 credits) (includes Emphasis)

Note: Grades lower than a C will not be accepted toward major requirements.

Level I (6 credits)

ELED 1000 Orientation to Elementary Education (F,Sp,Su)	3
FCHD 1500 (BSS) Human Development Across the Lifespan (F,Sp) ...	3

Level II (12 credits) (courses taken concurrently)

Students must be admitted to the Teacher Education Program prior to taking these classes.

ELED 3000 (CI) Foundation Studies and Practicum in Teaching and Classroom Management Level II (F,Sp)	6
FCHD 2250 Seminar and Practicum in Early Childhood Education (F,Sp)	4
PSY 3660 Educational Psychology for Teachers (F,Sp)	2

Transition (14 credits)

SPED 4000 Education of Exceptional Individuals (F,Sp,Su)	2
ELED 3100 Teaching Reading I (F,Sp,Su)	3
INST 4010 Principles and Practices of Technology for Elementary Teachers (F,Sp,Su)	3
FCHD 4550 ³ Preschool Methods and Curriculum (F,Sp)	3
ELED 4480 ³ Early Childhood Education Kindergarten through Grade 3 (F, Sp)	3

Level III (15 credits; must follow Level II) (courses taken concurrently during fall, spring, or summer semester)

ELED 4000 Teaching Science and Practicum Level III	3
ELED 4030 (CI) Teaching Language Arts and Practicum Level III	3
ELED 4040 (CI) Teaching Reading II and Practicum Level III	3
ELED 4050 Teaching Social Studies and Practicum Level II	3
ELED 4060 Teaching Mathematics and Practicum Level III	3

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Level IV (21 credits) (taken during two semesters)

ELED 5050 ⁴ Student Teaching—Kindergarten (F,Sp)	6
ELED 5100 ⁴ Student Teaching—Primary Grades (1-3) (F,Sp)	6
ELED 5250 ⁴ Student Teaching—Seminar (F,Sp)	3
FCHD 4960 ⁵ Practice Teaching in Child Development Laboratories (F,Sp,Su)	6

³Level II must be completed prior to taking this course.

⁴Level III and ELED 4480 must be completed prior to taking this course.

⁵FCHD 4550 must be completed prior to taking this course.

Emphasis (12 credits) (C- or better required)

A listing of available Emphasis areas is shown below. For a listing of required and recommended courses, students should contact their advisor.

Electives (to complete 120 credits)

The following courses are recommended to be taken as electives.

ART 3700 Elementary Art Methods (F,Sp)	3
MUSC 3260 Elementary School Music (F,Sp,Su)	2
PEP 3050 Physical Education in the Elementary School (F,Sp,Su)	3
HEP 3500 Elementary School Health Education (F,Sp)	2
FCHD 2610 Parenting and Child Guidance (F,Sp)	3

Elementary/Early Childhood Areas of Emphasis

Students majoring in Elementary Education or Early Childhood Education are required to complete an area of Emphasis. All students majoring in Elementary Education, Early Childhood Education, or Dual Elementary Education and Early Childhood Education must complete an area of Emphasis consisting of 12 credits. The area of Emphasis must be chosen from the following fields: Language Arts, Social Studies, Mathematics, Mathematics/General Science, General Science, Fine Arts, Art, Music, Physical Education, Health/Wellness/Nutrition, School Library Media, a Foreign Language, or an English as a Second Language (ESL) Endorsement.

Composite Elementary Education and Special Education Major

Elementary Education Major (65 credits) (includes Teaching Support Courses)

Students should complete all of the following courses as indicated.

Note: Teaching licensure requires a 2.75 cumulative grade point average (GPA). (Grades lower than a C will not be accepted toward the major.)

Level I (6 credits)

ELED 1000 Orientation to Elementary Education (F,Sp,Su)	3
FCHD 1500 (BSS) Human Development Across the Lifespan (F,Sp) ...	3

Level II (courses taken concurrently during spring semester) (18 credits)

Students must be admitted to the Teacher Education Program prior to taking these classes.

ELED 3000 (CI) Foundation Studies and Practicum in Teaching and Classroom Management (Level II)	8
SPED 4000 Education of Exceptional Individuals	2
PSY 3660 Educational Psychology for Teachers	2
SPED 5530 Technology for Teaching Exceptional Learners	3
ELED 3100 Teaching Reading I	3

Level III (courses taken concurrently during fall, spring, or summer semester) (15 credits)

ELED 4000 Teaching Science and Practicum Level III	3
ELED 4030 (CI) Teaching Language Arts and Practicum Level III	3
ELED 4040 (CI) Teaching Reading II and Practicum Level III	3
ELED 4050 Teaching Social Studies and Practicum Level III	3
ELED 4060 Teaching Mathematics and Practicum Level III	3

Level IV (15 credits) (taken during fall or spring semester)

ELED 5150 Student Teaching—Elementary (Grades 4-6)	6
SPED 5210 (CI) ⁶ Student Teaching in Special Education: Dual Majors	6
ELED 5250 Student Teaching—Seminar	3

⁶Students must complete Special Education major coursework prior to student teaching.

Teaching Support Courses

MUSC 3260 Elementary School Music (F,Sp,Su)	2
PEP 3050 Physical Education in the Elementary School (F,Sp,Su)	3
COMD 2910 (CI) ⁷ Sign Language I (F,Sp,Su)	4
HEP 2000 ⁷ First Aid and Emergency Care (F,Sp)	2

⁷Required for Special Education—Severe specialization only.

Special Education Major (33 or 29 credits)

Students should choose *either* the **Mild/Moderate** specialization *or* the **Severe** specialization.

Students must be admitted to the Special Education program prior to taking these courses.

Mild/Moderate Specialization (33 credits)

Fall:

SPED 5010 (QI) Applied Behavioral Analysis 1: Principles, Assessment, and Analysis	3
SPED 5040 Foundations of Effective Assessment and Instructional Practices	3
SPED 5070 Policies and Procedures in Special Education	3
SPED 5310 Teaching Reading and Language Arts to Students with Mild/Moderate Disabilities	4
SPED 5330 Eligibility Assessment for Students with Mild/Moderate Disabilities	1
SPED 5410 Practicum: Direct Instruction Reading and Language Arts for Students with Mild/Moderate Disabilities	3

Spring:

SPED 5050 Applied Behavioral Analysis 2: Applications	3
SPED 5060 Consulting with Parents and Teachers	3
SPED 5320 Teaching Content Areas and Transition to Students with Mild/Moderate Disabilities	3
SPED 5340 Teaching Math to Students with Mild/Moderate Disabilities	3
SPED 5420 Practicum: Teaching Mathematics to Students with Mild/Moderate Disabilities	4

Severe Specialization (29 credits)

Fall:

SPED 5010 (QI) Applied Behavioral Analysis 1: Principles, Assessment, and Analysis	3
SPED 5040 Foundations of Effective Assessment and Instructional Practices	3
SPED 5070 Policies and Procedures in Special Education	3

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SPED 5510 Curriculum for Students with Severe Disabilities	4
SPED 5600 Practicum: Introduction to Instruction of Students with Severe Disabilities	3

Spring:

SPED 5050 Applied Behavioral Analysis 2: Applications	3
SPED 5060 Consulting with Parents and Teachers	3
SPED 5520 Curriculum for Secondary-Level Students with Severe Disabilities	3
SPED 5610 Practicum: Advanced Systematic Instruction of Students with Severe Disabilities	4

Composite Early Childhood Education and Special Education—Early Childhood Major

Early Childhood Education Major (68 credits)

Students should complete all of the following courses as indicated.

Note: Teaching licensure requires a 2.75 cumulative grade point average (GPA). (Grades lower than a C will not be accepted toward the major.)

Level I (6 credits)

ELED 1000 Orientation to Elementary Education (F,Sp,Su)	3
FCHD 1500 (BSS) Human Development Across the Lifespan (F,Sp) ...	3

Level II (courses taken concurrently during fall or spring semester) (15 credits)

Students must be admitted to the Teacher Education Program prior to taking these classes.

ELED 3000 (CI) Foundation Studies and Practicum in Teaching and Classroom Management Level II	6
FCHD 2250 Seminar and Practicum in Early Childhood Education	4
PSY 3660 Educational Psychology for Teachers	2
ELED 3100 Teaching Reading 1	3

Transition (11 credits)

SPED 5530 Technology for Teaching Exceptional Learners (Sp <i>only</i>) ..	3
SPED 4000 Education of Exceptional Individuals (F,Sp,Su)	2
FCHD 4550 ⁸ Preschool Methods and Curriculum (F,Sp)	3
ELED 4480 ⁸ Early Childhood Education Kindergarten through Grade 3	3

Level III (courses taken concurrently during fall, spring, or summer semester) (15 credits)

ELED 4000 Teaching Science and Practicum Level III	3
ELED 4030 (CI) Teaching Language Arts and Practicum Level III	3
ELED 4040 (CI) Teaching Reading II and Practicum Level III	3
ELED 4050 Teaching Social Studies and Practicum Level III	3
ELED 4060 Teaching Mathematics and Practicum Level III	3

Level IV (courses taken during two semesters, fall and spring) (21 credits)

ELED 5250 ⁹ Student Teaching—Seminar	3
ELED 5050 ⁹ Student Teaching—Kindergarten	3
ELED 5100 ⁹ Student Teaching Primary Grades (1-3)	6
SPED 5210 (CI) ⁹ Student Teaching in Special Education: Dual Majors	6
FCHD 4960 ¹⁰ Practice Teaching in Child Development Laboratories (Su also)	3

⁸Level II must be completed prior to taking this course.

⁹Level III, Special Education major, and ELED 4480 must be completed prior to taking this course.

¹⁰FCHD 4550 must be completed prior to taking this course.

Special Education—Early Childhood Major (31 credits)

Students must be admitted to the Special Education program prior to taking these courses.

Fall:

SPED 5010 (QI) Applied Behavioral Analysis 1: Principles, Assessment, and Analysis	3
SPED 5040 Foundations of Effective Assessment and Instructional Practices	3
SPED 5070 Policies and Procedures in Special Education	3
SPED 5730 Intervention Strategies for Young Children with Disabilities	3
SPED 5820 Preschool Practicum with Young Children with Disabilities in Community Environments	4
SPED 5840 Seminar: Preschool Practicum with Young Children with Disabilities	2

Spring:

SPED 5050 Applied Behavioral Analysis 2: Applications	3
SPED 5060 Consulting with Parents and Teachers	3
SPED 5710 Young Children with Disabilities: Characteristics and Services	3
SPED 5810 Seminar and Field Experiences with Infants and Families	4

Composite Elementary Education and Deaf Education Major

Elementary Education Major (61 credits) (includes Teaching Support Courses)

Students should complete all of the following courses as indicated.

Note: Teaching licensure requires a 2.75 cumulative grade point average (GPA). (Grades lower than a C will not be accepted toward the major.)

Level I (6 credits)

ELED 1000 Orientation to Elementary Education (F,Sp,Su)	3
FCHD 1500 (BSS) Human Development Across the Lifespan (F,Sp) ...	3

Level II (courses taken concurrently during fall or spring semester) (18 credits)

Students must be admitted to the Teacher Education Program prior to taking these classes.

ELED 3000 (CI) Foundation Studies and Practicum in Teaching and Classroom Management Level II	8
SPED 4000 Education of Exceptional Individuals	2
PSY 3660 Educational Psychology for Teachers	2
INST 4010 Principles and Practices of Technology for Elementary Teachers	3
ELED 3100 Teaching Reading I	3

Level III (courses taken concurrently during fall, spring, or summer semester) (15 credits)

ELED 4000 Teaching Science and Practicum Level III	3
ELED 4030 (CI) Teaching Language Arts and Practicum Level III	3
ELED 4040 (CI) Teaching Reading II and Practicum Level III	3
ELED 4050 Teaching Social Studies and Practicum Level III	3
ELED 4060 Teaching Mathematics and Practicum Level III	3

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Level IV (Student Teaching—taken during Master's Program)

Teaching Support Courses

MUSC 3260 Elementary School Music (F,Sp,Su)	2
PEP 3050 Physical Education in the Elementary School (F,Sp,Su)	3
HEP 3500 Elementary School Health Education (F,Sp)	2

Deaf Education Requirements (47-49 credits)

COMD 2500 Language, Speech, and Hearing Development (F,Sp)	3
COMD 2910 (CI) Sign Language I (F,Sp,Su)	4
COMD 3080 American Sign Language Practicum (F,Sp)	1-3
COMD 3910 Sign Language II (F,Sp,Su)	4
COMD 5610 Introduction to Education of the Deaf and Hard of Hearing (F)	3

Note: COMD 2500, 2910, 3910, and 5610 should be completed prior to the Deaf Education blocks.

Fall:

COMD 4750 Teaching the English Language to Individuals who are Deaf and Hard of Hearing	3
COMD 4770 Audiology and Teachers of Children who are Deaf and Hard of Hearing	3
COMD 4780 Socio-Cultural Aspects of Deafness	3
COMD 4910 (CI) Sign Language III	4
COMD 5740 Teaching Reading to Deaf and Hard of Hearing Children	3

Spring:

COMD 4630 Teaching Speech to Deaf and Hard of Hearing Children	3
COMD 4790 Psychological Principles	3
COMD 4920 Sign Language IV	4
COMD 5600 Classroom Teaching Using American Sign Language	3
COMD 5620 Teaching School Subjects to Students who are Deaf and Hard of Hearing	3

Composite Early Childhood Education and Deaf Education Major

Early Childhood Education Major (56 credits)

Students should complete all of the following courses as indicated.

Note: Teaching licensure requires a 2.75 cumulative grade point average (GPA). (Grades lower than a C will not be accepted toward the major.)

Level I (6 credits)

ELED 1000 Orientation to Elementary Education (F,Sp,Su)	3
FCHD 1500 (BSS) Human Development Across the Lifespan (F,Sp)	3

Level II (courses taken concurrently during fall or spring semester) (15 credits)

Students must be admitted to the Teacher Education Program prior to taking these classes.

ELED 3000 (CI) Foundation Studies, Practicum in Teaching and Classroom Management Level II	6
FCHD 2250 Seminar and Practicum in Early Childhood Education	4
PSY 3660 Educational Psychology for Teachers	2
INST 4010 Principles and Practices of Technology for Elementary Teachers	3

Transition (11 credits)

SPED 4000 Education of Exceptional Individuals	2
ELED 3100 Teaching Reading 1	3
FCHD 4550 ¹¹ Preschool Methods and Curriculum	3
ELED 4480 ¹¹ Early Childhood Education Kindergarten through Grade 3	3

Level III (courses taken concurrently during fall, spring, or summer semester) (15 credits)

ELED 4000 Teaching Science and Practicum Level III	3
ELED 4030 (CI) Teaching Language Arts and Practicum Level III	3
ELED 4040 (CI) Teaching Reading II and Practicum Level III	3
ELED 4050 Teaching Social Studies and Practicum Level III	3
ELED 4060 Teaching Mathematics and Practicum Level III	3

Level IV (courses taken during two semesters, fall and spring) (9 credits)

ELED 5050 ¹² Student Teaching—Kindergarten	6
FCHD 4960 ¹³ Practice Teaching in Child Development Laboratories (Su also)	3

¹¹Level II must be completed prior to taking this course.

¹²Level III and ELED 4480 must be completed prior to taking this course.

¹³Level II and FCHD 4550 must be completed prior to taking this course.

Deaf Education Requirements (47-49 credits)

COMD 2500 Language, Speech, and Hearing Development (F,Sp)	3
COMD 2910 (CI) Sign Language I (F,Sp,Su)	4
COMD 3080 American Sign Language Practicum (F,Sp)	1-3
COMD 3910 Sign Language II (F,Sp,Su)	4
COMD 5610 Introduction to Education of the Deaf and Hard of Hearing (F)	3

Note: COMD 2500, 2910, 3910, and 5610 should be completed prior to the Deaf Education blocks.

Fall:

COMD 4750 Teaching the English Language to Individuals who are Deaf and Hard of Hearing	3
COMD 4770 Audiology and Teachers of Children who are Deaf and Hard of Hearing	3
COMD 4780 Socio-Cultural Aspects of Deafness	3
COMD 4910 (CI) Sign Language III	4
COMD 5740 Teaching Reading to Deaf and Hard of Hearing Children	3

Spring:

COMD 4630 Teaching Speech to Deaf and Hard of Hearing Children	3
COMD 4790 Psychological Principles	3
COMD 4920 Sign Language IV	4
COMD 5600 Classroom Teaching Using American Sign Language	3
COMD 5620 Teaching School Subjects to Students who are Deaf and Hard of Hearing	3

Endorsements

The USU Elementary Education Department and Secondary Education Department jointly offer a K-12 English as a Second Language (ESL) Endorsement, as well as a Middle-Level Endorsement. Graduate endorsements are also available in Early Childhood Education, ESL, Reading, Gifted and Talented, and Middle-Level Education.

Department of Elementary Education

Departmental Honors

Students having majors within the Department of Elementary Education may choose to add breadth and depth to their regular course offerings by enrolling in the departmental honors program. A cumulative GPA above 3.5 is required for enrollment.

Through original, independent work, Honors students enjoy the benefits of close supervision and mentoring, as they work one-on-one with faculty in select upper-division departmental courses. Honors students also complete a senior project, which provides another opportunity to collaborate with faculty on a problem that is significant, both personally and in the student's discipline. Participating in departmental honors enhances students' chances for obtaining fellowships and admission to graduate school. Students may enter the Honors Program at almost any stage in their academic career, including at the junior (and sometimes senior) level.

For additional information about departmental honors within the Department of Elementary Education, contact Deborah Byrnes, (435) 797-0396, deborah.byrnes@usu.edu.

Additional Information

For more information concerning requirements for University graduation and for basic professional teaching licensure in elementary education, early childhood education, and middle education, see major requirement sheets available from the Elementary Education Department Advisement Center, Emma Eccles Jones Education Building, Room 373. Major requirement sheets can also be found online at: <http://www.usu.edu/ats/majorsheets/>

Financial Support

The following scholarships are available to junior and senior students: Ballam, Blair, Bowen, DeHart, Frye, Hales, Jackson, Kurzhals, McEvoy, Stewart, Taylor, Vest, Watterson, and Young. To be eligible, students must have completed Level II of the Elementary Education Program and have a cumulative GPA of 3.5 or higher. Applications are available from the Elementary Education Department and are due by February 1.

Graduate Programs

Admission Requirements

Students applying for admission to master's programs must have GRE scores at or above the 40th percentile. This same percentile is the minimum required on the MAT. For the doctorate degree, GRE scores at or above the 40th percentile are also required on the verbal and quantitative tests. Admission committees also consider experience, undergraduate record, curricula completed, and formal recommendations. One year of successful elementary school teaching experience is required for the master's program. Two years of teaching experience or the equivalent is required for admission to the doctoral program. Students with deficient oral or written English skills will be required to complete additional coursework to improve their skills.

Admission to graduate programs is contingent upon (1) completion of an application to graduate school and (2) recommendation by the department screening committee for the master's program or the management admissions committee for the doctoral program. In addition to the requirements of the School of Graduate Studies (see

pages 93-94), letters of recommendation must be received from three professionals in education.

Degree Programs—On Campus

Three avenues exist for on-campus students wishing to pursue a master's degree in the Department of Elementary Education at Utah State University. They are as follows:

Master of Arts/Master of Science—Plan A

Students planning to pursue a future doctoral degree or wishing to follow a traditional master's degree should complete a Master of Arts or Master of Science (Plan A) degree. This is a 36-credit program, including 6 credits for the thesis. EDUC 6570 is required as a research course (rather than EDUC 6550). A copy of the Program of Study form listing other required core and professional option courses is available from the department office. A committee chair and two committee members will work with students pursuing the Plan A master's degree. Plan A students should submit an Appointment for Examination form to their major professor, committee, and the Graduate School at least five working days before the final examination is to be held.

Requirements for the Master of Arts degree include two years of an acceptable foreign language or the equivalent, as determined by testing arranged by the supervisory committee and approved by the department and the graduate dean. One year each, or the equivalent, of two languages is acceptable if approved by the student's committee.

Master of Education—Plan B

Students wishing to include a creative project as part of their master's degree program should enroll in the Master of Education (Plan B) program. Three credits will be given for ELED 6960, Master's Creative Project. All MEd students will complete EDUC 6550 (Research for Classroom Teachers, 3 credits) and other courses listed on the current Program of Study form. A committee chair and two committee members will work with students completing the creative project; however, the chairperson will have major responsibility in approving the proposal and primarily work as the program advisor, with the committee members being involved more directly in the presentation of the creative project.

Master of Education—Plan C

In order to provide another option for prospective elementary education master's degree students, the Department of Elementary Education conducts a Plan C option within its Master of Education Degree. The basic elements of a Plan C option include completion of 40 credits of prior approved graduate courses, completion of an exit paper, and an oral review.

The exit paper should be a pre-planned scholarly activity. It could be a paper discussing coursework applicability to the student's teaching assignment, or a written plan for changing curriculum and/or instruction drawing on coursework and the student's role, etc. The intent is that the exit paper be an integral part of the planned course of study.

A notice of intent to complete the degree must be filed with the School of Graduate Studies *at the beginning of the last semester of coursework*. A letter of completion should be filed by the department chairperson upon successful completion of all requirements.

Degree Programs—Off Campus

Two avenues exist for students wishing to pursue a master's degree in the Department of Elementary Education at Utah State University

Department of Elementary Education

primarily through offerings at USU Continuing Education centers. They are as follows.

Master of Education—Plan B

Off-campus students wishing to include a creative project as part of their master's degree program should enroll in the Master of Education Program. Three credits will be given for ELED 6960 (Master's Creative Project). All MEd students will complete the required core and other courses listed on the current Program of Study form. A committee chair and two committee members will work with students completing the creative project; however, the chairperson will have major responsibility in approving the proposal and primarily work as the program advisor, with the committee members being involved more directly in the presentation of the creative project (oral exam).

Master of Education—Plan C

In order to provide another option for prospective off-campus elementary education master's degree students, the Department of Elementary Education conducts a Plan C option within its Master of Education Degree. The basic elements of a Plan C option include completion of 40 credits or prior approved graduate courses, completion of an exit paper, and an oral review.

The exit paper should be a pre-planned scholarly activity. It could be a paper discussing coursework applicability to the student's teaching assignment, or a written plan for changing curriculum and/or instruction drawing on coursework and the student's role, etc. The intent is that the exit paper be an integral part of the planned course of study.

A notice of intent to complete the program should be filed by the student with the department and the School of Graduate Studies *at the beginning of the semester the candidate is to finish the degree*. A letter of completion should be filed by the committee chairperson upon successful completion of all requirements.

Doctoral Programs (PhD and EdD)

The department participates in the Interdepartmental Doctoral Program in Education, which includes the Doctor of Philosophy (PhD) and the Doctor of Education (EdD). For information about areas of specialization, emphasis of study, research sponsored, admission requirements, procedures to follow, and other information, see pages 223-224 of this catalog.

Additional Information

All students completing master's degrees in Elementary Education must enroll for a minimum of 10 credits *on the USU campus*, except for students completing their degrees at the following USU continuing education centers: Uintah Basin Campus (Vernal and Roosevelt), Moab Center, Price Center, and Blanding Center.

The Program of Study form for the appropriate degree and plan described above should be approved by the committee and submitted to the School of Graduate Studies *at least two months prior to the oral exam, oral review, or presentation appropriate to that degree*.

After matriculation into the program, a master's degree must be completed within a six-year time period. Pass/fail grades will be accepted only for seminars, special problems, interdisciplinary workshops, thesis or dissertation research, and continuing graduate advisement. A maximum of 8 workshop credits may be included. Transfer credit accepted toward a degree is normally limited to 6 credits; however, with prior approval, 12 transfer credits may be accepted. A maximum of 15 credits taken during one summer may

be counted toward the degree. A maximum of 12 credits taken before admission to the program may be counted toward the degree. All coursework in a student's area of specialization must be taken at the 6000 level or above, in order to be applied toward a graduate degree in the Department of Elementary Education. Coursework goes out-of-date after eight years.

Admission deadlines for students applying to graduate programs are: June 15 for fall semester, October 15 for spring semester, and March 15 for summer semester.

Research

Cooperation with other departments and research centers at the University, as well as with public school and State Office of Education collaborators, permits strong graduate programs in all phases of elementary education. Research opportunities are available with the Edith Bowen Laboratory School, cooperating school districts in Utah and surrounding states, the Utah State Office of Education, and the United States Department of Education.

Financial Assistance

Both departmental and School of Graduate Studies support are available for the regular academic program and are awarded on a competitive basis. Students requesting financial support should apply to the department by March 15. To be eligible for financial assistance, a student must attend USU full-time. No financial assistance is available for summer semester.

Assistantships

Teaching assistantships are available through the department. Some research assistantships are available through faculty members who have ongoing projects with off-campus funding agencies.

Students are not eligible for assistantships or any form of financial assistance from the University until all application procedures are completed and the student is formally admitted to a program of studies.

Acceptance to pursue graduate study does not guarantee student financial assistance. Inasmuch as funds are limited, the assistantships are awarded by the department to cover specific teaching assignments and by the faculty to provide for research.

Doctoral students desiring information about financial assistance should write to: Coordinator, Doctoral Degrees, College of Education and Human Services, 2800 Old Main Hill, Utah State University, Logan UT 84322-2800.

Career Opportunities

Positions in Higher Education— Master Teachers

Many school districts support and encourage teachers to further their education and expertise by obtaining a master's degree. Added financial remuneration generally accompanies the completion of such a degree. Supervisors, curriculum specialists, and other professional careers are enhanced by completion of a master's degree.

Completion of a doctorate degree qualifies the graduate for a wide variety of careers, including positions in higher education, curriculum specialist positions in school districts and state offices of education, positions in educational agencies of the United States government, and educational specialist positions in business and industry.

Department of Elementary Education

Elementary Education Faculty

Emma Eccles Jones Distinguished Professor

D. Ray Reutzel, reading

Professors

Deborah A. Byrnes, social studies education, early childhood education

Martha T. Dever, foundations, early childhood education

Bernard L. Hayes, reading education

Associate Professors

James J. Barta, mathematics, early childhood education

Gary L. Carlston, instructional leadership

James T. Dorward, mathematics, program evaluation, middle level education

Parker C. Fawson, reading

Scott L. Hunsaker, gifted/talented education, foundations

Francine Fukui Johnson, foundations, gifted/talented education, supervision

Rebecca M. Monhardt, science education

John A. Smith, reading education

Martha L. Whitaker, foundations

Assistant Professors

Tricia M. Gallagher-Geurtsen, social studies, multicultural/multilingual education

Leigh C. Monhardt, science education

Lisa Pray, bilingual/English-as-a-second-language education

Sylvia Read, language arts education

Temporary Lecturers

Lorilynn B. Brandt, reading education

Judy Greene, language arts/foundations

Course Descriptions

Elementary Education (ELED), pages 502-505

Department of Engineering and Technology Education

Department Head: Maurice G. Thomas
Location: Industrial Science 112E
Phone: (435) 797-1795
FAX: (435) 797-2567
E-mail: mthomas@cc.usu.edu
WWW: <http://www.engineering.usu.edu/ete/>

Graduate Program Coordinator:
Edward M. Reeve, Industrial Science 108, (435) 797-3642,
fast@cc.usu.edu

Undergraduate Advisor:
Ronnie Green, Engineering 312, (435) 797-2790,
ronnie@engineering.usu.edu

Degrees offered: Bachelor of Science (BS) and Master of Science (MS) in Engineering and Technology Education, BS in Aviation Technology—Maintenance Management, BS in Aviation Technology—Professional Pilot, A&P Certificate in Aircraft Maintenance Technician—Airframe & Powerplant

Undergraduate emphases: *BS in Engineering and Technology Education—Technology Education and Trade and Technical Education*

Undergraduate Programs

Objectives

The Department of Engineering and Technology Education offers degrees in two fields: **engineering and technology education** and **aviation technology**. The department values the integration of academic knowledge with hands-on technical skills. This is achieved by emphasizing the application of scientific and technological principles in extensive laboratory activities. The department strives to ensure that all graduates will obtain employment to match their interests and preparation.

The **Engineering and Technology Education** programs prepare graduates to teach in public schools, applied technology colleges, and community colleges. **Aviation Technology—Maintenance Management** graduates fill aviation maintenance management positions in government and industry. The **Aviation Technology—Professional Pilot** curriculum prepares graduates to be professional pilots. The **A&P Certificate in Aircraft Maintenance Technician—Airframe & Powerplant** provides training and FAA licensing for graduates to perform maintenance and repairs on aircraft.

Admission Requirements

Admission requirements are commensurate with those outlined for the University. See pages 16-19 in this catalog.

Professional Technology Program (PTP)

The Professional Technology Program (PTP) applies to the Aviation Technology—Maintenance Management major, as well as to the Aviation Technology—Professional Pilot major. The purpose of the program is to provide a quality education for students by requiring that they be fully prepared for upper-division coursework by having satisfactorily completed all required pre-professional courses.

Enrollment in upper-division AV and ETE courses (3000-level and above) is available only to students who have been accepted into the PTP or into an appropriate graduate program or to students with a non-ETE major requiring a specific class. (Non-ETE majors may take a *maximum of two* upper-division AV or ETE classes.)

To be eligible to apply for admission to a professional program, a student must be in good academic standing in the University and college, must achieve a grade of *C-* or better in every required preprofessional course, and must have an overall grade point average of 2.0 in required preprofessional coursework completed at USU.

A student can repeat no more than three of the required preprofessional courses in order to satisfy the PTP application and eligibility requirements. Multiple repeats of the same course are included in the total of three repeats. Audits count as a time taking a class unless prior written approval is obtained from the college academic advisor.

Although transfer credit accepted by the department and the college may be applied toward PTP admission requirements, the grades received will not be used in the USU GPA calculation. A final decision on admission of a transfer student into the PTP will not be made until after the applicant has completed at least 15 credits of acceptable coursework at USU.

Eligible students must apply for admission to the PTP during the semester in which they are completing the required preprofessional courses.

For all technology majors in the Professional Program, the following academic regulations apply in addition to University regulations:

1. A minimum GPA of 2.0 must be maintained in technology/math/science/business courses required for, or used as technical electives in, the chosen major. Courses which were part of the preprofessional program requirements and University Studies courses are not included in this GPA calculation.
2. No more than 6 hours of *D* or *D+* credit may be applied toward meeting graduation requirements in technology/math/science/business classes.
3. College of Engineering courses may be repeated only once. Audits count as a time taking a class unless prior written approval is obtained from the department head. A maximum of three required or elective courses completed as part of a Professional Program can be repeated in order to meet graduation requirements. (Courses completed as part of a preprofessional program are not included in this total of three repeats.)
4. The *P-D-F* grading option may not be used in required or elective courses completed as part of a Professional Program. (The *P-D-F* grading option is approved for University Studies courses.)
5. The academic regulations listed above (1-4) apply to required coursework and any technology/math/science/business course which could be used to satisfy graduation requirements for the chosen degree. That is, once a student completes a particular technical elective, it becomes a required course for that student.
6. Students in violation of departmental or college academic regulations, no longer eligible for graduation, or not making satisfactory progress toward a degree will be placed on probation.

Department of Engineering and Technology Education

- Students will be placed on probation if they (i) earn an *F* in a technology/math/science/business course which could be used to satisfy graduation requirements for the chosen degree (see item 5 above); (ii) have more than 6 hours of *D* credit (see item 2 above); or (iii) have a GPA of less than 2.0 (see item 1 above).
- Students remain on probation until they improve their standing by repeating and passing all failed classes, repeating classes to reduce the number of *D* credits to 6 or less, and/or by raising their GPA above 2.0.
- While on probation, a student must earn a semester GPA of 2.0 or higher in technology/math/science/business classes and must not earn any grades of *D* or *F*.

While on probation, a student may not preregister. The student's major code will be changed to a preprofessional code. The student must meet at least once per semester with the college academic advisor to work out a schedule having the primary goal of correcting the existing academic problems.

Requirements

Bachelor of Science in Engineering and Technology Education

Technology Education Emphasis

The Technology Education emphasis is designed to prepare students for teaching in junior and senior high schools. Students should follow the suggested semester schedule presented below, completing all courses listed. Consult with an advisor when choosing elective courses. All students in this program must maintain a cumulative GPA of 2.75 and gain admission to teacher education, in order to student teach and to receive secondary education licensure (College of Education and Human Services). The suggested semester schedule is as follows:

Freshman Year (33 credits)

Fall Semester (17 credits)

ETE 1000 ² Orientation to Engineering and Technology Education	1
ETE 1010 Communications Technology	3
ETE 1030 Material Processing Systems	3
ETE 1200 Computer-Aided Drafting and Design	3
ENGL 1010 (CL) Introduction to Writing: Academic Prose	3
MATH 1050 (QL) ⁴ College Algebra	4

Spring Semester (16 credits)

ETE 1020 Energy, Power, Transportation Systems Control Technology	3
ETE 1040 Construction and Estimating	3
MATH 1060 Trigonometry	2
University Studies Breadth Courses	6
Elective Course	2

Sophomore Year (33 credits)

Fall Semester (16 credits)

Note: Students should apply to the Secondary Teacher Education Program (STEP) *early* (see advisor).

ETE 2030 Wood-Based Manufacturing Systems	3
ETE 2300 (QI) ⁶ Electronic Fundamentals	4
ETE 3220 Architecture and Construction Systems	3
University Studies Breadth Course	3
Elective Course	3

Spring Semester (17 credits)

ETE 3030 Computer-Integrated Manufacturing Systems	3
ETE 3050 Computer Systems and Networking	3
ENGL 2010 (CL) Intermediate Writing: Research Writing in a Persuasive Mode	3
PHYX 1800 (BPS) ^{5,7} Physics of Technology	4
SPED 4000 ^{2,3} Education of Exceptional Individuals	2
Elective Course	2

Junior Year (31 credits)

Fall Semester (16 credits)

ETE 3200 ^{2,3} Methods of Teaching Engineering and Technology Education I	3
ETE 3300 ^{2,3} Clinical Experience I	1
SCED 3100 ^{2,3} Motivation and Classroom Management	3
SCED 3210 (CI/DSS) ^{2,3,5} Educational and Multicultural Foundations	3
University Studies Breadth Courses	6

Spring Semester (15 credits)

ETE 3040 Engineering Systems	3
ETE 4300 ^{2,3} Clinical Experience II	1
ETE 4400 ^{2,3} Methods of Teaching Engineering and Technology Education II	3
SCED 4200(CI) ^{2,3} Reading, Writing and Technology	3
SCED 4210 ² Cognition and Evaluation of Student Learning	3
ADVS 2040 Introduction to Biotechnology	1
INST 3500 ¹ Technology Tools for Secondary Teachers	1

Senior Year (27 credits)

Fall Semester (12 credits)

ETE 5500 ^{2,3} Student Teaching Seminar	2
ETE 5630 ^{2,3} Student Teaching in Secondary Schools	10

Spring Semester (15 credits)

ETE 3440 (DSC) Science, Technology, and Modern Society	3
ETE 5220 (CI) Program and Course Development	3
University Studies Depth Humanities and Creative Arts (DHA) Course	3
Elective Courses	6

¹ The INST 3500 requirement has been waived. However, INST 4500 is recommended.

² This course is included in the Secondary Education Licensure Requirements. Prior to enrolling in this course, students must be admitted to the STEP.

³ Students must maintain a cumulative 2.75 GPA for admission to the College of Education and Human Services, for student teaching, and to receive secondary education licensure.

⁴ A Math ACT score of 23 or higher is required for enrolment in MATH 1050. If Math ACT score is between 18 and 22, student should enroll in MATH 1010 first.

⁵ PHYX 1800 fulfills the University Studies Breadth Physical Sciences (BPS) requirement. SCED 3210 fulfills the University Studies Depth Social Sciences (DSS) requirement.

⁶ MATH 1050 is a prerequisite for ETE 2300.

⁷ MATH 1050 and 1060 are prerequisites for PHYX 1800 (which needs to be completed during the sophomore year).

Trade and Technical Education Emphasis

The Trade and Technical Education emphasis is designed to prepare students to teach vocational courses at the high school or post-high school level. Students should complete all courses listed below. All students in this emphasis must maintain a GPA of 2.75 in order to student teach.

INST 3500 Technology Tools for Secondary Teachers (F,Sp,Su)	1
ETE 3200 Methods of Teaching Engineering and Technology Education I (F)	3
ETE 3300 Clinical Experience I (F)	1
ETE 3900 Principles and Objectives of Career and Technical Education	3
ETE 3930 Evaluation of Career and Technical Education	2
ETE 4300 Clinical Experience II (Sp)	1
ETE 4400 Methods of Teaching Engineering and Technology Education II (Sp)	3

Department of Engineering and Technology Education

ETE 4700 Student Teaching in Postsecondary Schools	4
ETE 5220 (CI) Program and Course Development (Sp)	3
ETE 5910 Special Problems in Industrial Technology and Education	1-4
SPED 4000 Education of Exceptional Individuals (F,Sp,Su)	2
ENGL 1010 (CL) Introduction to Writing: Academic Prose (F,Sp,Su) ..	3
ENGL 2010 (CL) Intermediate Writing: Research Writing in a Persuasive Mode (F,Sp,Su).....	3
BIS 1400 Microcomputer Applications in Business (F,Sp,Su)	3
MATH 1050 (QL) College Algebra (F,Sp,Su).....	4
SPCH 1050 (CI) Public Speaking (F,Sp)	3
STAT 2000 (QI) Statistical Methods (F,Sp,Su)	3
University Studies	24
General Electives	9

State licensure requires a minimum of two years of approved vocational experience. Successful completion of a trade competency examination is accepted in lieu of vocational experience.

Bachelor of Science in Aviation Technology—Maintenance Management

Aviation Technology—Maintenance Management graduates are qualified to enter the work force in many rewarding career fields in aviation. Employment opportunities exist in target industries such as major airline carrier maintenance management, commuter airline maintenance management, fixed-base operator (FBO) maintenance, and Federal Aviation Administration (FAA) aircraft inspection after some field experience. This major has a great deal of depth in general maintenance, which applies to most industrial maintenance operations. Although the major's focus is aviation, the knowledge and skills gained can be used in other fields.

The suggested semester schedule for **Aviation Technology—Maintenance Management** is as follows:

Freshman Year (34 credits)

Fall Semester (17 credits)

AV 1130 ⁸ Flight Principles	2
AV 1140 ⁸ Aircraft Components and Principles	2
AV 1170 Aircraft Structures	3
AV 2180 Aircraft Hydraulic and Pneumatic Systems.....	2
AV 2200 Aircraft Hydraulics and Pneumatic Systems Lab	1
MATH 1050 (QL) ^{8,9} College Algebra	4
University Studies Breadth Course ^{11,12}	3

Spring Semester (17 credits)

AV 1240 Aircraft Maintenance	3
AV 2170 ⁸ Aircraft Systems.....	2
AV 2190 Aircraft Systems Lab.....	1
ETE 1030 ¹¹ Material Processing Systems.....	3
ETE 1200 ¹¹ Computer-Aided Drafting and Design	3
MATH 1060 ^{8,15} Trigonometry	2
University Studies Breadth Course ^{11,12}	3

Sophomore Year (33 credits)

Fall Semester (16 credits)

AV 2100 Aircraft Reciprocating Powerplants and Accessories.....	3
AV 2110 Aircraft Reciprocating Powerplants and Accessories Lab.....	3
ETE 2300 (QI) ^{8,9} Electronic Fundamentals.....	4
BIS 1400 ^{8,11} Microcomputer Applications in Business.....	3
ENGL 1010 (CL) ^{8,11,12} Introduction to Writing: Academic Prose	3

Spring Semester (17 credits)

AV 1100 ¹¹ The Aviation Profession.....	1
AV 2140 ⁸ Aircraft Turbine Powerplants and Maintenance Operations ..	3
AV 2150 ⁸ Aircraft Turbine Powerplant Maintenance Operations Lab ..	3
AV 2430 Aircraft Electrical Systems and Components	2
AV 2440 Aircraft Electrical Systems Laboratory	2
ENGL 2010 (CL) ^{8,11,12} Intermediate Writing: Research Writing in a Persuasive Mode.....	3
University Studies Breadth Course ^{11,12}	3

Junior Year (30 credits)

Fall Semester (14 credits)

AV 3010 ¹¹ National Airspace, Air Traffic Control, and Airport Administration.....	3
AV 3280 Advanced Turbine Engines	2
MATH 1100 (QL) ^{11,12} Calculus Techniques.....	3
Technical Elective ¹³	3
University Studies Breadth Course ^{11,12}	3

Spring Semester (16 credits)

AV 2420 FAA Regulations, Records, and Certification	2
AV 3610 AeroTechnology Design I	1
AV 4490 Human Factors in Aviation Safety.....	3
MHR 3110 (DSS) ^{10,11,12,14} Managing Organizations and People.....	3
PHYX 1800 (BPS) ^{9,14,15} Physics of Technology	4
University Studies Depth Humanities and Creative Arts (DHA) Course ^{11,12}	3

Senior Year (29 credits)

Fall Semester (16 credits)

AV 3120 Aviation Law.....	3
AV 4610 (CI) AeroTechnology Design II	3
MHR 3710 ^{10,11,12} Developing Team and Interpersonal Skills.....	3
STAT 2300 (QL) ^{9,12} Business Statistics.....	4
University Studies Breadth Course ^{11,12}	3

Spring Semester (13 credits)

AV 4620 (CI) AeroTechnology Design III	3
AV 4200 Composite Manufacturing Processes and Repair	3
Technical Electives ¹³	7

⁸ This course is required for entrance to the Professional Technology Program (PTP). Completion of the Computer and Information Literacy (CIL) exam with a passing grade is also required.

⁹ A Math ACT score of 23 or higher is required to enroll in MATH 1050. If Math ACT score is between 18 and 22, student should enroll in MATH 1010 first. MATH 1050 is a prerequisite for STAT 2300, ETE 2300, and PHYX 1800.

¹⁰ Students must have a cumulative GPA of at least 2.67 and have professional status to be admitted to these College of Business courses.

¹¹ Due to teaching load constraints, these courses may be offered during semesters other than those listed here. Check with the department regularly for possible changes. Most of these classes are offered only once each year.

¹² These courses may be taken during summer semester to allow for more reasonable course loads during the academic year.

¹³ Students must take 10 credits of technical electives which must be in upper-division courses (3000-level and above).

¹⁴ PHYX 1800 fulfills the University Studies Breadth Physical Sciences (BPS) requirement. MHR 3110 fulfills the University Studies Depth Social Sciences (DSS) requirement.

¹⁵ MATH 1060 is a prerequisite for PHYX 1800.

Bachelor of Science in Aviation Technology—Professional Pilot

Aviation Technology—Professional Pilot graduates are trained to be commercial pilots. The degree requirements include completion of the following FAA licenses: private, instrument, commercial, CFI, CFII, and Multi-Engine. The suggested semester schedule for this degree is as follows:

Department of Engineering and Technology Education

Freshman Year (31 credits)

Fall Semester (15 credits)

AV 1100 The Aviation Profession	1
AV 1130 Flight Principles	2
AV 2330 ¹⁶ Private Pilot Ground School	4
AV 2350 ^{16,19} Private Pilot Certification	1
MATH 1050 (QL) ^{16,21} College Algebra	4
University Studies Breadth Course	3

Spring Semester (16 credits)

AV 2170 Aircraft Systems	2
AV 2510 ^{16,19} Intermediate Flight	1
BIS 1400 ¹⁶ Microcomputer Applications in Business	3
BMET 2000 (BPS) ¹⁶ The Atmosphere and Weather	3
ENGL 1010 (CL) ¹⁶ Introduction to Writing: Academic Prose	3
MATH 1060 ¹⁶ Trigonometry	2
Elective	2

Sophomore Year (34 credits)

Fall Semester (17 credits)

AV 2180 Aircraft Hydraulic and Pneumatic Systems	2
AV 2520 ^{16,22} Instrument Pilot Ground School	4
AV 2540 ¹⁹ Instrument Pilot Certification I	1
ETE 2300 (QI) ^{16,20} Electronic Fundamentals	4
BIS 1550 (CI) Business Correspondence (taught through Center for Independent and Distance Learning only)	3
University Studies Breadth Course	3

Spring Semester (17 credits)

AV 2430 Aircraft Electrical Systems and Components	2
AV 2550 ¹⁹ Instrument Pilot Certification II	1
AV 2620 Commercial Pilot Ground School	2
BMET 3250 ²² Aviation Weather	3
ENGL 2010 (CL) ²⁰ Intermediate Writing: Research Writing in a Persuasive Mode	3
MATH 1100 (QL) ²⁰ Calculus Techniques	3
University Studies Breadth Course	3

Junior Year (30 credits)

Fall Semester (16 credits)

AV 2660 ¹⁹ Commercial Pilot Certification	1
AV 3010 National Airspace, Air Traffic Control, and Airport Administration	3
AV 3120 Aviation Law	3
AV 3140 Advanced Avionics Systems and Flight Simulation	3
AV 4280 Airline Operations	3
University Studies Breadth Course	3

Spring Semester (14 credits)

AV 2720 CFI and CFII Ground School	3
AV 2880 ¹⁹ Multi-Engine Certification	1
AV 4490 Human Factors in Aviation Safety	3
AV 5400 Regional Jet Ground School I	4
MHR 3110 (DSS) ^{17,18} Managing Operations and People	3

Senior Year (31 credits)

Fall Semester (15 credits)

AV 2740 ¹⁹ CFI Certification	1
AV 2860 ¹⁹ CFII Certification	1
AV 4660 (CI) Flight Senior Project	3
AV 5410 Regional Jet Ground School II	4
Upper-division Elective ¹⁷	3
University Studies Breadth Course	3

Spring Semester (16 credits)

ETE 5910 Special Problems: Regional Jet Simulator	3
PHYX 1800 (BPS) ^{18,23} Physics of Technology	4
Upper-division Electives ¹⁷	6
University Studies Depth Humanities and Creative Arts (DHA)	3

¹⁶ This course is required for entrance to the Professional Technology Program (PTP). Completion of the Computer and Information Literacy (CIL) exams with passing grades is also required for PTP admission.

¹⁷ Students should contact their advisor for a list of approved upper-division electives.

¹⁸ MHR 3110 fulfills the University Studies Depth Social Sciences (DSS) requirement. PHYX 1800 fulfills the University Studies Breadth Physical Sciences (BPS) requirement.

¹⁹ Depending on weather and other factors, flying courses may be taken during semesters other than those indicated. It is imperative that students work with their advisors and flight instructor to determine the best arrangement for these courses.

²⁰ MATH 1050 is a prerequisite for ETE 2300 and MATH 1100.

²¹ A Math ACT score of 23 or higher is required to enroll in MATH 1050. If Math ACT score is between 18 and 22, student should enroll in MATH 1010 first.

²² Students should take BMET 2000 prior to taking AV 2520 and BMET 3250.

²³ MATH 1050 and 1060 are prerequisites for PHYX 1800.

Students must complete a total of 40 credits of upper-division coursework. University Studies courses and electives must be used to fill part of this requirement.

A&P Certificate in Aircraft Maintenance Technician—Airframe & Powerplant

This two-year technical program emphasizes aircraft repair and maintenance. Required courses are:

AV 1130 Flight Principles (F)	2
AV 1140 Aircraft Components and Principles (F)	2
AV 1170 Aircraft Structures (F)	3
AV 1240 Aircraft Maintenance (Sp)	3
AV 2100 Aircraft Reciprocating Powerplants and Accessories (F)	3
AV 2110 Aircraft Reciprocating Powerplants and Accessories Lab (F)	3
AV 2140 Aircraft Turbine Powerplants and Maintenance Operations (Sp)	3
AV 2150 Aircraft Turbine Powerplant Maintenance Operations Lab (Sp)	3
AV 2170 Aircraft Systems (Sp)	2
AV 2180 Aircraft Hydraulic and Pneumatic Systems (F)	2
AV 2190 Aircraft Systems Lab (Sp)	1
AV 2200 Aircraft Hydraulics and Pneumatics Systems Lab (F)	1
AV 2420 FAA Regulations, Records, and Certification (Sp)	2
AV 2430 Aircraft Electrical Systems and Components (Sp)	2
AV 2440 Aircraft Electrical Systems Laboratory (Sp)	2
AV 3280 Advanced Turbine Engines (F)	2
AV 4200 Composite Manufacturing Processes and Repair (Sp)	3
ETE 1030 Material Processing Systems (F,Sp)	3
ETE 1200 Computer-Aided Drafting and Design (F,Sp,Su)	3
ETE 2300 (QI) Electronic Fundamentals (F,Su)	4
MATH 1050 (QL) College Algebra (F,Sp,Su)	4
MATH 1060 Trigonometry (F,Sp,Su)	2
PHYX 1800 (BPS) Physics of Technology	4
ENGL 1010 (CL) Introduction to Writing: Academic Prose (F,Sp,Su)	3

FAA regulations require students to earn a 70 percent or higher score to pass each course.

Departmental Honors

Students who would like to experience greater academic depth within their major are encouraged to enroll in departmental honors. Through original, independent work, Honors students enjoy the benefits of close supervision and mentoring, as they work one-on-one with faculty in select upper-division departmental courses. Honors students also complete a senior project, which provides another opportunity to collaborate with faculty on a problem that is significant, both personally and in the student's discipline. Participating in departmental honors

Department of Engineering and Technology Education

enhances students' chances for obtaining fellowships and admission to graduate school. Minimum GPA requirements for participation in departmental honors vary by department, but usually fall within the range of 3.30-3.50. Students may enter the Honors Program at almost any stage in their academic career, including at the junior (and sometimes senior) level. The campus-wide Honors Program, which is open to all qualified students regardless of major, offers a rich array of cultural and social activities, special classes, and the benefit of Honors early registration. Interested students should contact the Honors Program, Merrill Library 374, (435) 797-2715, honors@cc.usu.edu. Additional information can be found online at: <http://www.usu.edu/honors/>

Additional Information

For more information about Bachelor of Science requirements and the sequence in which courses should be taken, see major requirement sheets, available from the Engineering and Technology Education Department, or online at: <http://www.usu.edu/ats/majorsheets/>

Graduate Programs

The Master of Science (MS) degree in Engineering and Technology Education is offered by the department. Candidates may choose either the Plan A thesis option or the Plan B nonthesis program.

Admission Requirements

See the general admission requirements for graduate study in this catalog (pages 93-94). Students applying for admission to the MS program must complete the GRE with a minimum quantitative and verbal score of 1,000 and a 40th percentile minimum score on the verbal and quantitative tests or must complete the MAT with a minimum score of 43. Admission committees also consider experience, undergraduate record, and formal recommendations.

MS Degree

The degree is designed for technology educators who want to strengthen their background in current educational theory and practice. Students are required to complete a professional core of courses relating to technology education or applied technology education and to select additional courses from a list of related courses. Plan A requires a minimum of 30 semester credits, including a thesis. Plan B is a nonthesis option that requires 33 semester credits, including a creative project. The core courses for this specialization are as follows: ETE 6090, 6100, 6150, 6450, and 6750.

Financial Assistance

The department offers a limited number of graduate research and teaching assistantships. For further information, contact the Engineering and Technology Education Department.

Engineering and Technology Education Faculty

Professors

Kurt Becker, technology education, construction technology, computer aided drafting

Edward M. Reeve, technology education, communication technology

Maurice G. Thomas, technology education

Professor Emeritus

Jay C. Hicken, technology education, wood technology, power/energy transportation

Associate Professors

Ward P. Belliston, computer electronics technology

Gary A. Stewardson, technology education, manufacturing technology

Associate Professor Emeritus

David P. Widauf, aviation technology

Assistant Professors

Kevin S. Garrity, aviation technology, professional pilot

Paul D. Schreuders, engineering education

Senior Lecturer

James L. Garrett, aviation maintenance

Lecturers

Randall W. Chesley, aviation maintenance

Gary R. Green, aviation technology, professional pilot

Chief Flight Instructor

Sean E. Heiner

Course Descriptions

Aviation Technology (AV), pages 462-463

Engineering and Technology Education (ETE), pages 506-509

Department of English

Department Head: Jeffrey Smitten
Location: Ray B. West 201
Phone: (435) 797-2733
FAX: (435) 797-3797
E-mail: info@english.usu.edu
WWW: <http://websites.usu.edu/english/>

Associate Department Head:
Patricia M. Gantt, Ray B. West 205, (435) 797-2718,
pgantt@english.usu.edu

Director, Graduate Studies:
Keith A. Grant-Davie, Ray B. West 310, (435) 797-3547,
kgrant-davie@english.usu.edu

Director, Undergraduate Studies:
Kathryn R. Fitzgerald, Ray B. West 204F, (435) 797-0235,
kfitzgerald@english.usu.edu

Advisor, Undergraduate Studies:
Lisa R. Hamblin, Student Center 302, (435) 797-3883,
lisa.hamblin@usu.edu

**Director, American Studies Program
and American Studies Graduate Advisor:**
Jan E. Roush, Ray B. West 312G, (435) 797-2729,
jroush@english.usu.edu

Director, Folklore Program:
Jeannie B. Thomas, Ray B. West 302B, (435) 797-2736,
jthomas@english.usu.edu

Director, Writing Program and Director, Utah Writing Project:
Lynn L. Meeks, Family Life 201, (435) 797-2723,
lmeeks@english.usu.edu

Director, Writing Center:
Charlene A. Hirschi, Ray B. West 104B, (435) 797-3853,
chirschi@english.usu.edu

Associate Director, Writing Center:
Star Coulbrooke, Ray B. West 103B, (435) 797-2726,
scoulbrooke@english.usu.edu

Degrees offered: Bachelor of Science (BS), Bachelor of Arts (BA),
Master of Science (MS), and Master of Arts (MA) in English; BS,
BA, MS, and MA in American Studies; Doctor of Philosophy (PhD) in
Theory and Practice of Professional Communication

Undergraduate emphases: *BS, BA in English*—Literary Studies,
Professional and Technical Writing, English Teaching, and Creative
Writing

Graduate specializations: *MS, MA in English*—Literature and Writing,
Technical Writing; *MS, MA in American Studies*—Folklore, Public
Sector Folklore

Undergraduate Programs

General Objectives

The undergraduate programs in English and American Studies encourage students to gain an appreciation of language and literature through reading, analysis, and writing as a means of enriching their lives as individuals, citizens and professionals. Through a variety

of courses in literature, writing, and linguistics, students develop an awareness of these subjects in their personal and cultural contexts, a heightened sensitivity to human experience, and a capacity to adapt to a world of continually changing values and centers of conflict. Students majoring in English or American Studies thus acquire communicative, analytical, and interpretive skills that help prepare them for a wide range of careers.

After completing a set of core requirements, students in English fulfill the requirements in one of four emphases: (1) the **Literary Studies** emphasis, which gives students a knowledge of the texts and writers of American, British, and world literature and their cultural contexts; (2) the **Professional and Technical Writing** emphasis, which prepares students for various writing careers in professional organizations; (3) the **English Teaching** emphasis, which prepares students for teaching secondary-level English in the public school system; and (4) the **Creative Writing** emphasis, which trains students in the art of literary writing and prepares them for graduate study in creative writing programs. The English Department also offers a major in American Studies.

The English Department offers a Folklore minor and an interdisciplinary American Studies major and minor. The American Studies Program, situated within the English Department, offers students the opportunity to explore American life and cultures from interdisciplinary perspectives, while preparing them for careers in academic or professional fields. Students may pursue *either* an American Studies major or minor *or* a folklore minor. It also offers an English Teaching Minor, an English Minor (Standard Nonteaching), and a minor in British and Commonwealth Studies.

The English Department also offers specific courses supporting other fields of specialization, courses fulfilling University Studies requirements, and enriching educational experiences through opportunities for creativity and expression enhancing lifetime activities.

Admission and Graduation Requirements

The requirements for admission and graduation are commensurate with those described on pages 16-19 and 55-58 of this catalog. To remain in good standing and to obtain approval for graduation as English majors or minors, students must maintain a minimum grade point average of 2.75 in their major and minor courses. All courses listed as major or minor subject courses must be taken on an *A-B-C-D-F* basis, and major or minor subject courses passed with less than a C grade must be repeated. Transfer students are required to complete at least 15 semester credits of major subject courses and 10 semester credits of minor subject courses in residence at USU.

Students in the English Teaching major and minor may also apply to the Secondary Teacher Education Program (STEP). See pages 413-414 for procedures and requirements pertaining to teacher licensure and admission requirements, or go online to:
<http://www.coe.usu.edu/>.

Course Requirements

Core and Survey Requirements

All English majors (except for students in the Professional and Technical Writing Emphasis) are required to complete the following courses as soon as possible before enrolling in upper-division courses: ENGL 1110 (an orientation course); and three of the 2000-level literature survey courses. Differing requirements for the Professional and Technical Writing Emphasis are shown below.

Literary Studies Emphasis

This 49-credit emphasis is devoted to the study of literature. Its fundamental premise is that literature is a field of diverse representations that gives shape and meaning to human experience.

Students first complete three of the 2000-level survey courses, which provide a traditional overview of the major periods, authors, and genres of American and British literature. At the same time, students take an introductory course on literary theory which, in addition to introducing them to the methodologies of literary criticism, challenges received notions about the canon and literary history.

At the 3000 and 4000 levels, students closely examine the conventions and principles forming the more traditional survey courses. Focusing on specific literary periods, authors, and genres, these courses invite students to think critically about how literature is constructed and organized as a field of knowledge. They also take a linguistics course in which they study the structure and history of the English language.

At the 5000 level, students pursue advanced study of literature in relation to issues of gender and sexuality, regional and national boundaries, and cultural differences. These courses provide the advanced theoretical tools necessary to analyze the relationship between literature and culture. These courses insist that literary texts both exist within and depend upon a complex network of other cultural representations. Students also select one elective course in authors or genres from ENGL courses numbered 4300 through 4370.

The final course, a senior capstone seminar (ENGL 5350), encourages graduating students to both synthesize and critique their differing educational experiences within the program.

A. Core Requirements (4 credits)

ENGL 1110 English Orientation (F, Sp)	1
ENGL 2100 ¹ Introduction to Literary Theory (F, Sp)	3

B. Literary History (9 credits)

Select three courses from the following:

ENGL 2140 British Literary History: Anglo-Saxon to 18th Century (F, Sp, Su)	3
ENGL 2150 British Literary History: Romanticism to Present (F, Sp, Su)	3
ENGL 2160 American Literary History: Colonialism to 1865 (F, Sp, Su)	3
ENGL 2170 American Literary History: 1865 to Present (F, Sp, Su)	3

C. American, British, and World Literature (9 credits)

ENGL 3300 ² Period Studies in American Literature (F, Sp)	3
ENGL 3310 ² Period Studies in British Literature (F, Sp)	3
ENGL 3320 ² Period Studies in World Literature (F, Sp)	3

D. Linguistics (3 credits)

Select one of the following courses:

ENGL 4200 Linguistic Structures (F, Sp, Su)	3
ENGL 4210 History of the English Language (Sp)	3

E. Authors (6 credits)

Complete ENGL 4300 and one other course.

ENGL 4300 ² Shakespeare (F, Sp)	3
ENGL 4310 ² American Writers (F, Sp)	3
ENGL 4320 ² British Writers (F, Sp)	3
ENGL 4330 ² World Writers (F)	3

F. Genre (6 credits)

Select two courses from the following:

ENGL 4340 ² Studies in Prose Fiction (Sp)	3
ENGL 4350 ² Studies in Poetry (F)	3
ENGL 4360 ² Studies in Drama/Film (Sp)	3
ENGL 4370 ² Studies in Nonfiction Prose (F)	3

G. Literature and Culture (6 credits)

Select two courses from the following:

ENGL 5300 (CI) ² Literature and Gender (F, Sp)	3
ENGL 5320 (CI) ² Literature and Cultural Difference (Sp)	3
ENGL 5340 (CI) ² Studies in Literary and Cultural Theory (F)	3

H. Capstone Seminar (3 credits)

ENGL 5350 (CI) ³ Literary Studies Capstone (Sp)	3
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I. Electives (3 credits)

Select one additional course from category E or F.

Professional and Technical Writing Emphasis

This 49-credit emphasis prepares students for career opportunities in various writing-related careers in professional organizations. The emphasis consists of: (1) a theoretical foundation in rhetoric and linguistics, enabling students to assess any writing situation and adapt their writing to the context as audience-aware writers; and (2) writing practice in a variety of contexts using the most up-to-date tools of technology, so that students know how to write and why they are writing, thus preparing them for the ever-changing job markets of the twenty-first century.

Students begin their studies by completing one literature survey course and two introductory professional writing courses introducing students to the profession of writing and the current technologies used in all levels of text production. ENGL 3400 (Professional Writing) and ENGL 3410 (Professional Writing Technology), which are prerequisites for applications courses, must be passed with a grade of B- or better, in order for the student to continue in the program. At the same time, students also take two courses addressing rhetorical issues and strategies in the perception, reading, and writing of texts, and two courses in linguistics acquainting students with the structure and diversity of the English language.

In addition, all Professional and Technical Writing students must pass ENGL 1120 (Elements of Grammar) with a grade of B- or better, or pass the challenge exam offered by the Writing Center.

Students then take courses in professional editing, document design and graphics, interactive media, and publication production and management. Along with these, students may also take courses in creative writing, as well as those with more specific forms of writing, such as proposals, newsletters, and computer documentation. Internships provide students with an opportunity to learn through hands-on experiences in a variety of organizations. Students complete the program by taking a capstone course, in which they prepare portfolios, explore professional opportunities, and prepare to begin their careers.

A. Core Requirements (4 credits)

ENGL 1110 English Orientation (F, Sp)	1
ENGL 1120 ⁴ Elements of Grammar (F, Sp)	3

B. Literary History (3 credits)

Select one course from the following:

ENGL 2140 British Literary History: Anglo-Saxon to 18th Century (F, Sp, Su)	3
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ENGL 2150 British Literary History: Romanticism to Present (F, Sp, Su)	3
ENGL 2160 American Literary History: Colonialism to 1865 (F, Sp, Su)	3
ENGL 2170 American Literary History: 1865 to Present (F, Sp, Su)	3

C. Introductory Professional Writing Courses (6 credits)

ENGL 3400 (CI) Professional Writing (F, Sp)	3
ENGL 3410 Professional Writing Technology (F, Sp)	3

D. Theoretical Foundation Courses (6 credits)

Select two courses from the following:

ENGL 3450 Reading Theory for Writers (F, Sp)	3
ENGL 3460 Modern Rhetorical Theory (F, Sp)	3
ENGL 5490⁷ Usability Studies: Theory and Practice (F, Sp)	3

E. Linguistics Courses (6 credits)

Select two courses from the following:

ENGL 4200 Linguistic Structures (F, Sp, Su)	3
ENGL 4210 History of the English Language (Sp)	3
ENGL 4230 Language and Society (F)	3
ENGL 5210 Topics in Linguistics (F)	3

F. Applied and Creative Writing Courses (6 credits)

Complete 6 credits from the following:

ENGL 3040 Perspectives in Writing and Rhetoric (F, Sp)	3
ENGL 3420 Fiction Writing (F)	3
ENGL 3430 Poetry Writing (F, Sp)	3
ENGL 3440 Creative Nonfiction Writing (F, Sp)	3
ENGL 4250 Playwriting (F)	3
ENGL 4420 Advanced Fiction Writing (Sp)	3
ENGL 4430 Advanced Poetry Writing (Sp)	3
ENGL 4440 Advanced Nonfiction Writing (Sp)	3
ENGL 4900 Internship/Cooperative Work Experience (F, Sp, Su)	1-6

G. Major Courses (15 credits)

ENGL 4400 (CI)⁶ Professional Editing (F)	3
ENGL 4410⁶ Document Design and Graphics (F, Sp)	3
ENGL 5400^{5,6} Specialized Documents (F, Sp)	3
ENGL 5410^{6,8} Interactive Media (F, Sp)	3
ENGL 5420⁶ Publications Production (Sp)	3

H. Capstone Seminar (3 credits)

ENGL 5430 (CI)³ Professional Writing Capstone (Workplace Culture and Communication) (F, Sp)	3
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English Teaching Emphasis

This 52-credit emphasis, leading to professional licensure in the teaching of secondary-level English, prepares prospective English teachers to participate actively in the many communities related to the profession. Students become well-versed in their academic subject matter (language, writing, literature, and multimedia); skilled in the methods of teaching the various components of the English curriculum and in classroom management techniques; and committed to the achievement of students regardless of gender, race, ethnic, religious, or socioeconomic background.

Students first complete 9 credits of literature survey courses and 3 credits of literary theory to acquire a broad understanding of the traditional literary canon and the current theoretical foundations of English studies. They must also take ENGL 1120 (Elements of Grammar), or pass the challenge exam offered by the Writing Center. They then take 12 credits in upper-division literature and then courses which address the current understandings of the diversity of American language and culture as they impact the English classroom. Students take courses in young adult literature, Shakespeare, and 15 more

credits of upper-division literature and writing courses to become familiar with the spectrum of theoretical, ideological, and scholarly issues at stake in English studies today. To become familiar with the art of teaching the many components of the English curriculum, students take two pedagogical courses, which approach reading and writing as interdependent aspects of communication. If students wish to obtain professional licensure at graduation, they must also fulfill the requirements of the 35-credit Secondary Teacher Education Program (STEP) prescribed by the Department of Secondary Education.

A. Core Requirements (4 credits)

ENGL 1110 English Orientation (F, Sp)	1
ENGL 2100 Introduction to Literary Theory (F, Sp)	3

B. Literary History (9 credits)

Select three courses from the following:

ENGL 2140 British Literary History: Anglo-Saxon to 18th Century (F, Sp, Su)	3
ENGL 2150 British Literary History: Romanticism to Present (F, Sp, Su)	3
ENGL 2160 American Literary History: Colonialism to 1865 (F, Sp, Su)	3
ENGL 2170 American Literary History: 1865 to Present (F, Sp, Su)	3

C. Linguistics (3 credits)

ENGL 4200 Linguistic Structures (F, Sp, Su)	3
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D. Upper-division Writing Courses (3 credits)

Select one course from the following:

ENGL 3400 (CI) Professional Writing (F, Sp)	3
ENGL 3420 Fiction Writing (F)	3
ENGL 3430 Poetry Writing (F, Sp)	3
ENGL 3440 Creative Nonfiction Writing (F, Sp)	3
ENGL 4420 Advanced Fiction Writing (Sp)	3
ENGL 4430 Advanced Poetry Writing (Sp)	3
ENGL 4440 Advanced Nonfiction Writing (Sp)	3

E. Upper-division Literature Courses (15 credits)

1. Required Course (3 credits)	
ENGL 4300 Shakespeare (F, Sp)	3

2. Select one course from each of the following groups:

a. Group 1 (3 credits)	
ENGL 3300 Period Studies in American Literature (F, Sp)	3
ENGL 4310 American Writers (F, Sp)	3
ENGL 4610 Western American Literature (F)	3
ENGL 4630 American Nature Writers (F, Sp)	3

b. Group 2 (3 credits)	
ENGL 3310 Period Studies in British Literature (F, Sp)	3
ENGL 4320 British Writers (F, Sp)	3

c. Group 3 (3 credits)	
ENGL 3320 Period Studies in World Literature (F, Sp)	3
ENGL 4330 World Writers (F)	3
CLAS 3210 Classical Mythology (Honors only) (Sp)	3

d. Group 4 (3 credits)	
ENGL 4340 Studies in Prose Fiction (Sp)	3
ENGL 4350 Studies in Poetry (F)	3
ENGL 4360 Studies in Drama/Film (Sp)	3
ENGL 4370 Studies in Nonfiction Prose (F)	3
Folklore Courses: ENGL 3700 (Regional Folklore), 3710 (Folklore Colloquium), 4700 (Folk Material Culture), 4750 (Folklore Summer Workshop, Fife Conference), 5700 (Folk Narrative)	3

F. English Education Courses (15 credits)

ENGL 3510 Young Adult Literature (F, Sp)	3
ENGL 3520 Multicultural American Literature (F, Sp)	3
ENGL 4220 Ethnic Literacy (F, Sp)	3
ENGL 4500 (CI) Teaching Writing (F, Sp)	3
ENGL 4510 (CI) Teaching Literature (F, Sp)	3

G. Capstone Seminar (3 credits)

ENGL 5550 English Teaching Capstone (Sp)	3
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In addition to fulfilling the above requirements, students in the English teaching emphasis must fulfill a grammar competency requirement. This may be accomplished either by enrolling in ENGL 1120, Elements of Grammar, (also offered through Independent Study) or by passing a challenge exam in the English Department Writing Center (Ray B. West 104) with a score of 80 percent or better. See the English undergraduate advisor for further information.

H. Teaching Minor

Students in the English Teaching emphasis are also required to complete a teaching minor selected from among the following: Business Computer and Information Systems, Business Information Technology and Education, Chemistry, Geography, Health Education, History, Marketing Education, Mathematics, Modern Languages (French, German, Spanish), Physical Education Coaching, Physics, Political Science, Psychology, School Library Media, Sociology, Speech Communication, English as a Second Language, and Theatre Arts.

I. Secondary Teacher Education Program (STEP) (35 credits)

To receive a license to teach in the public school system, students in the English Teaching emphasis must also complete the 35-credit STEP administered through the Department of Secondary Education. The student enrolls in this three-semester sequence of courses after having completed nearly all teaching major and minor requirements and after having been granted full admission to the program, which entails meeting various admission criteria. See the Department of Secondary Education for further information regarding this program.

Creative Writing Emphasis

This 49-credit emphasis is devoted to the art of literary writing: fiction, poetry, creative nonfiction, and drama. Through practice in a chosen genre and a comprehensive study of literature, students learn the craft of literary writing as discovered and practiced over the last three thousand years of written human culture. The emphasis prepares undergraduates for graduate work in creative writing and develops critical, cognitive, and writing skills applicable in numerous professional fields.

Since creative writers must have a broad knowledge of literature, students first complete three of the 2000-level survey courses which provide an overview of major periods, authors, and genres in American and British literature. They also take an introductory course in literary theory which introduces methodologies of literary criticism.

At the 3000-level, students begin their work as creative writers, taking three introductory writing courses in three genres: fiction, poetry, and creative nonfiction. To continue their immersion in the study of literature, students take one course in Period Studies.

At the 4000-level, students concentrate their training as creative writers, taking two courses in advanced creative writing, courses which can be repeated. Also at the 4000-level, students take a course in the study of the English language, a course focused on the study of a single author, and a course in the study of one's chosen genre.

Students also select two courses (for 6 credits) from courses outside their emphasis, ideally from outside the English Department, to further broaden their knowledge of human culture and the natural world.

The emphasis culminates in a creative writing capstone, which encourages students to reflect upon and assess their experience in the creative writing program, and which also has students complete a portfolio of their best work.

A. Core Requirements (4 credits)

ENGL 1110 English Orientation (F, Sp)	1
ENGL 2100 Introduction to Literary Theory (F, Sp)	3

B. Literary History (9 credits)

Select three of the following courses:

ENGL 2140 British Literary History: Anglo-Saxon to 18th Century (F, Sp, Su)	3
ENGL 2150 British Literary History: Romanticism to Present (F, Sp, Su)	3
ENGL 2160 American Literary History: Colonialism to 1865 (F, Sp, Su)	3
ENGL 2170 American Literary History: 1865 to Present (F, Sp, Su)	3

C. Creative Writing Courses (15 credits)

Select all of the following courses:

ENGL 3420 Fiction Writing (F)	3
ENGL 3430 Poetry Writing (F, Sp)	3
ENGL 3440 Creative Nonfiction Writing (F, Sp)	3

Select two of the following courses:

ENGL 4250 Playwriting (F)	3
ENGL 4420 Advanced Fiction Writing (prereq. ENGL 3420) (Sp)	3
ENGL 4430 Advanced Poetry Writing (prereq. ENGL 3430) (Sp)	3
ENGL 4440 Advanced Nonfiction Writing (Sp)	3

D. American, British, and World Literature (3 credits)

Select one of the following courses:

ENGL 3300 ² Period Studies in American Literature (F, Sp)	3
ENGL 3310 ² Period Studies in British Literature (F, Sp)	3
ENGL 3320 ² Period Studies in World Literature (F, Sp)	3

Note: The Period Studies courses vary according to the specialty of the faculty member teaching the course.

E. Linguistics (3 credits)

Select one course:

ENGL 4200 Linguistic Structures (F, Sp, Su)	3
ENGL 4210 History of the English Language (Sp)	3

F. Authors (3 credits)

Select one of the following courses:

ENGL 4300 ² Shakespeare (F, Sp)	3
ENGL 4310 ² American Writers (F, Sp)	3
ENGL 4320 ² British Writers (F, Sp)	3
ENGL 4330 ² World Writers (F)	3

Note: The Writers courses vary according to the specialty of the faculty member teaching the course.

G. Genres (3 credits)

Select one of the following courses:

ENGL 4340 ² Studies in Prose Fiction (Sp)	3
ENGL 4350 ² Studies in Poetry (F)	3
ENGL 4360 ² Studies in Drama/Film (Sp)	3
ENGL 4370 ² Studies in Nonfiction Prose (F)	3

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Note: The Genre courses vary according to the specialty of the faculty member teaching the course.

H. Capstone Seminar (3 credits)

ENGL 5450³ Creative Writing Capstone (Sp)..... 3

I. Electives (6 credits)

¹ENGL 2100 should be taken before registering for 3000 or above literature courses.

²These courses are repeatable for credit.

³This capstone course should be completed during the senior year.

⁴ENGL1120 is waived if students pass the grammar challenge exam. For further information, contact the undergraduate advisor.

⁵ENGL 5400 includes proposals, brochures, environmental impact statements, newsletters, computer documentation, etc. This course is repeatable for credit.

⁶Prerequisite: Admittance to program and completion of ENGL 3400 and 3410 with grades of B- or better.

⁷Prior to enrolling in ENGL 5490, students must have completed either ENGL 3450 or 3460 with a grade of B- or better.

⁸ENGL 5410 includes multimedia, interactive and electronic texts, etc. This course is repeatable for credit.

American Studies Major and Minor

Many important issues associated with the origin, evolution, and manifestation of American culture transcend the boundaries of traditional subject areas and are best explored from a variety of perspectives or disciplines. The American Studies major and minor provide students with the opportunity to integrate studies in various fields into a broader understanding of American culture and its antecedents. Although housed in the Department of English, the American Studies Program permits students to choose relevant courses for their cognate areas from a variety of participating departments throughout the University.

For admission and graduation, students must have and maintain a minimum grade point average of 2.75. All courses used to fulfill either the major or minor requirements must be taken on an *A-B-C-D-F* basis, and major or minor courses passed with less than a *C* grade must be repeated. However, up to 3 credits of internship credit, which is recorded as *P/F*, may be used to partially fulfill the major requirements. Transfer students are required to take at least 15 credits of major subject courses and 10 credits of minor subject courses in residence at USU.

Major

To obtain a degree in American Studies, students must complete a total of 51 credits, including 12 credits of core requirements that introduce foundations of American literature, region, and culture; 6 credits chosen from the 3000 level that expose students to the diversity of American culture; and 9 credits of upper-division work (4000 level) that allow students to approach American literature and culture through various genres.

In addition to completing the required English classes, students must complete 21 credits from two of the following six cognate areas: creative writing, folklore, history, nature and environment, political science, and sociology and anthropology. Students will be required to meet with either the director or the undergraduate advisor (Lisa Hamblin, Student Center 302) to determine appropriate courses for the cognate areas.

The final course, a senior capstone, encourages graduating students to reflect on their overall coursework, synthesizing the perspectives they have gained about American culture in an extended research project reflecting their interdisciplinary academic experience.

Course Requirements

A. Core Requirements (12 credits)

ENGL 2160 American Literary History: Colonialism to 1865 (F, Sp, Su)..... 3

ENGL 2170 American Literary History: 1865 to Present (F, Sp, Su)..... 3
ENGL 2630 (BHU) American Culture and the Environment (F, Sp)..... 3
ENGL 4610 Western American Literature (F)..... 3

B. Choose two of the following courses (6 credits)

ENGL 3070 (DHA) Perspectives in Folklore (F, Su)..... 3
ENGL 3300 Period Studies in American Literature (F, Sp)..... 3
ENGL 3520 Multicultural American Literature (F, Sp)..... 3
ENGL 3620 Native American Studies (F)..... 3

C. Choose three of the following courses (9 credits)

ENGL 4310 American Writers (F, Sp)..... 3
ENGL 4340 Studies in Prose Fiction (Sp)..... 3
ENGL 4350 Studies in Poetry (F)..... 3
ENGL 4360 Studies in Drama/Film (Sp)..... 3
ENGL 4370 Studies in Nonfiction Prose (F)..... 3
ENGL 4620 (CI) Advanced Seminar in American Studies (F)..... 3
ENGL 4630 American Nature Writers (F, Sp)..... 3
ENGL/HIST 4640 (CI) Studies in the American West (F)..... 3
ENGL 4900 Internship/Cooperative Work Experience (F, Sp, Su)..... 1-3

D. Cognate Areas (21 credits)

Select two cognate areas and choose 9 credits from one and 12 credits from the other (21 credits total). Possible cognate course options are listed below.

1. Creative Writing
2. Folklore
3. History
4. Nature and Environment
5. Political Science
6. Sociology and Anthropology

E. Capstone Course (3 credits)

ENGL/HIST 5690 (CI) American Studies Capstone Seminar (Sp)..... 3

Cognate Course Options

Students are required to select **two** cognate areas and choose 9 credits from one and 12 credits from the other (21 credits total). Cognate courses *cannot* be used to fill University Studies requirements. A maximum of 3 credits can be completed in lower-division courses. The following are partial lists of appropriate courses. The Director of American Studies must approve substitutions.

1. Creative Writing

Select *three* or *four* courses from the following:

ENGL 3420 Fiction Writing (F)..... 3
ENGL 3430 Poetry Writing (F, Sp)..... 3
ENGL 3440 Creative Nonfiction Writing (F, Sp)..... 3
ENGL 4420 Advanced Fiction Writing (Sp)..... 3
ENGL 4430 Advanced Poetry Writing (Sp)..... 3
ENGL 4440 Advanced Nonfiction Writing (Sp)..... 3

2. Folklore

Select *three* or *four* courses from the following:

ENGL/HIST/ANTH 1710 (BHU) Introduction to Folklore (F, Sp, Su)..... 3
ENGL/HIST/ANTH 2720 Survey of American Folklore (F, Sp)..... 3
ENGL/HIST 3070 Perspectives in Folklore (F, Su)..... 3
ENGL/HIST 3700 (CI) Regional Folklore (F, Sp)..... 3
ENGL/HIST 3710 (CI) Folklore Colloquium (Sp)..... 3
ENGL/HIST 4700 Folk Material Culture (Sp)..... 3
ENGL/HIST 4750 Advanced Folklore Workshop: Fife Conference (Su)..... 3
ENGL/HIST/ANTH 5700 Folk Narrative (Sp)..... 3

3. History

Select *three* or *four* courses from the following:

HIST/ENGL 1600 American Cultures in Film (F, Sp)	3
HIST 2700 (BAI) United States to 1877 (F, Sp, Su)	3
HIST 2710 (BAI) United States 1877-Present (F, Sp, Su)	3
HIST 3720 Colonial America (F)	3
HIST 3730 The New American Nation (Sp)	3
HIST 3750 Civil War and Reconstruction (Sp)	3
HIST 3760 (CI) The United States, 1900-1945 (Sp)	3
HIST 3850 (CI) History of Utah (Sp)	3
HIST 4550 (CI) The History of Women and Family in America	3
HIST 4600 (CI) The History of the American West	3
HIST/ENGL 4640 (CI) Studies in the American West (F)	3
HIST 4710 American Indian History (F)	3
HIST 4730 (CI) History of Black America (Sp)	3
HIST 4740 American Immigration History (F)	3
HIST 4790 American Religious History	3
HIST 4810 American Military History	3

4. Nature and Environment

Select *three* or *four* courses from the following:

ENGL 4630 American Nature Writers (F, Sp)	3
ENVS 2340 (BSS) Natural Resources and Society (F, Sp)	3
ENVS 5110 Environmental Education (Sp)	3
FRWS 2200 (BLS) Ecology of Our Changing World (F, Sp)	3
HIST 3950 (CI) Environmental History	3
NR 1010 (BSS) Humans and the Changing Global Environment (F, Sp)	3
NR 2220 General Ecology (F, Sp)	3
PHIL 3510 Environmental Ethics (F, Sp)	3
POLS 4820 (DSS) Natural Resources and Environmental Policy (Sp)	3
SOC 3600 Sociology of Urban Places (F)	3
SOC 3610 (DSS) Rural Sociology (F)	3
SOC 4620 (DSS) Sociology of the Environment and Natural Resources (Sp)	3
SPCH 5250 Environmental Rhetoric (Sp)	3

5. Political Science

Select *three* or *four* courses from the following:

POLS 1100 (BAI) United States Government and Politics (F, Sp)	3
POLS 2200 (BSS) Comparative Politics (F, Sp)	3
POLS 3140 (DSS) The Presidency (F)	3
POLS/ECON 3170 Law and Economics (F)	3
POLS 3310 (DSS) American Political Thought (F)	3
POLS 3320 The Foundations of American Constitutionalism	3
POLS 3400 (DSS) United States Foreign Policy (F, Sp)	3
POLS 4130 Constitutional Theory (Sp)	3
POLS 4140 Political Organizations	3

6. Sociology and Anthropology

Select *three* or *four* courses from the following:

ANTH 1010 (BSS) Cultural Anthropology (F, Sp)	3
ANTH 3110 North American Indian Cultures (F)	3
ANTH 3130 (CI) Peoples of Latin America	3
ANTH 3200 (DSS/CI) Perspectives on Race (Sp)	3
ANTH 3300 (DSS) Archaeology in North America (Sp)	3
ANTH 4110 (DSS) Southwest Indian Cultures, Past and Present (F)	3
ANTH 4360 (DSS) Ancient Desert West (F)	3-4
ANTH 5800 Museum Development (F, Sp, Su)	1-3
SOC 1010 (BSS) Introductory Sociology (F, Sp)	3
SOC 2500 Sociology of Gender (F)	3
SOC 3010 Race, Class, and Gender (F, Sp)	3

American Studies Minor (21 credits)

American Studies minors must meet and maintain a 2.75 GPA admissions and graduation standard. Students are required to complete ENGL 2160, American Literary History: Colonialism to 1865; ENGL 2170, American Literary History: 1865 to Present; and one upper-division English course. They must also complete 12 credits of upper-division coursework drawn from two cognate areas. These courses of study must be approved by the Director of American Studies or by the American Studies advisor (Lisa Hamblin, Student Center 302) at least one year in advance of graduation. Courses used to fulfill requirements for the English and History majors may *not* be used for the American Studies minor.

Folklore Minor (18 credits)

The minor in folklore is an interdisciplinary program sponsored by the English Department and the History Department. The coursework for the minor must be approved by the Director of the Folklore Program (Ray B. West 302B) at least one year prior to graduation. Folklore minor students must maintain a 2.75 GPA admissions and graduation standard. Courses used to fulfill requirements for the English and History majors may *not* be used for the Folklore minor.

English Teaching Minor (27 credits)

English Teaching minor students must meet and maintain a 2.75 GPA for admission and graduation. This minor is available *only* to students completing a teaching major. Students may not use the P/D/F option, and grades C- and below must be repeated. They must complete the following courses:

ENGL 2140 British Literary History: Anglo-Saxon to 18th Century (F, Sp, Su) (3 cr) or	
ENGL 2150 British Literary History: Romanticism to Present (F, Sp, Su) (3 cr)	3
ENGL 2160 American Literary History: Colonialism to 1865 (F, Sp, Su) (3 cr) or	
ENGL 2170 American Literary History: 1865 to Present (F, Sp, Su) (3 cr)	3
ENGL 3510 Young Adult Literature (F, Sp)	3
ENGL 3520 Multicultural American Literature (F, Sp)	3
ENGL 4200 Linguistic Structures (F, Sp, Su)	3
ENGL 4220 Ethnic Literacy (F, Sp)	3
ENGL 4300 Shakespeare (F, Sp)	3
ENGL 4500 (CI) Teaching Writing (F, Sp)	3
ENGL 4510 (CI) Teaching Literature (F, Sp)	3

In addition to fulfilling the above requirements, students in the English teaching minor must fulfill a grammar competency requirement. This may be accomplished by either enrolling in ENGL 1120, Elements of Grammar, (also offered through Independent Study) or by passing a challenge exam in the English Department Writing Center (Ray B. West 104) with a score of 80 percent or better. See the English undergraduate advisor (Lisa Hamblin, Student Center 302) for further information.

English Minor (Standard Nonteaching) (18 credits)

The standard nonteaching minor consists of 18 credits of various courses, 12 of which must be in upper-division coursework. Nine of the 18 credits must be earned in residence at USU. Advanced Placement and CLEP credit and credit from ENGL 1010 and 2010 may *not* be counted toward this minor. The program must be approved by the Director of Undergraduate Studies at least one year prior to graduation.

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British and Commonwealth Studies Minor (18 credits)

The minor in British and Commonwealth Studies, sponsored jointly by the English and History departments, allows undergraduates to experience interdisciplinary study and broaden their international perspectives. Students engage in interdisciplinary study by doing extended work outside their home departments, while at the same time integrating their study around a single area. They enhance their international experience by deepening their knowledge of the British Isles and by expanding their knowledge of British culture through its contact with other world cultures in the imperial, Commonwealth, and post-colonial eras. This minor requires a minimum of 18 credits. The program selected must be approved by the coordinator of the British and Commonwealth Studies Minor *at least one year prior to graduation*. Alternatives to this program are possible, but any alternative must be approved by the coordinator. **Courses used to fulfill requirements for the English or History majors may not be used for the British and Commonwealth Studies minor.**

A. British and Commonwealth Cultures (3 credits)

ENGL/HIST 2040 (BHU) British and Commonwealth Cultures (Sp).....3

B. Select four courses from the following (12 credits)

ENGL 2140 British Literary History: Anglo-Saxon to 18th Century (F, Sp, Su)	3
ENGL 2150 British Literary History: Romanticism to Present (F, Sp, Su)	3
ENGL 3310 Period Studies in British Literature (F, Sp).....	3
ENGL 4300 Shakespeare (F, Sp).....	3
ENGL 4320 British Writers (F, Sp).....	3
HIST 3240 Modern Europe from 1789 to the Present.....	3
HIST 3510 Africa and the World.....	3
HIST 3720 Colonial America (F).....	3
HIST 4210 Celtic Europe (F, Sp)	3
HIST 4250 The Reformation in Britain: 1450-1688	3
HIST 4390 British Imperialism from 1688 to the Present	3

C. Complete one of the following two courses (3 credits)

ENGL 5920 Directed Study (F, Sp, Su).....	3
HIST 4930 Directed Readings.....	3

For further information about the British and Commonwealth Studies Minor, contact the program coordinator, Jeffrey Smitten, Ray B. West 201, (435) 797-2734, jsmitten@english.usu.edu.

Program Assessment

For information about how the English Department assesses its programs, click on the **Assessment** link on the departmental home page at: <http://websites.usu.edu/english/>

Departmental Honors

Students who would like to experience greater academic depth within their major are encouraged to enroll in departmental honors. Through original, independent work, Honors students enjoy the benefits of close supervision and mentoring, as they work one-on-one with faculty in select upper-division departmental courses. Honors students also complete a senior project, which provides another opportunity to collaborate with faculty on a problem that is significant, both personally and in the student's discipline. Participating in departmental honors enhances students' chances for obtaining fellowships and admission to graduate school.

Students are eligible for admission to the English departmental honors program if they: (1) are majoring in English or in American Studies, (2) have a cumulative GPA of at least 3.3, and (3) have a GPA in English courses (excluding ENGL 1010 and 2010) of at least 3.5. In order to earn a departmental honors degree, students must maintain these GPA levels, take 15 credits of approved upper-division English coursework for Honors credit, and complete and orally defend a Senior Honors Thesis. Typically, students take four 3-credit courses with honors contracts and one 3-credit independent study course (ENGL 5910, Senior Honors Thesis) in order to complete the 15 required credits for the program. For more information, follow the Honors Program link at: <http://websites.usu.edu/english/>

Additional Information and Updates

English programs are constantly being updated. Students should therefore confer with the English advisor, Lisa Hamblin (Student Center 302). Current requirement sheets are available online at: <http://www.usu.edu/ats/majorsheets/>

Financial Support and Scholarships

Scholarships, assistantships, grants-in-aid, and work-study programs are available through the University. In addition, the English Department employs a few students as tutors in The Writing Center and oversees various cooperative education and internship opportunities for students. Departmental scholarships are available on a competitive basis to juniors and seniors, as well as to some sophomores. Applications are accepted in January and February and are available in the college dean's office, Main 338. Further information can be found at:

<http://www.usu.edu/ats/generalcatalog/scholarships>

Graduate Programs

PhD in Theory and Practice of Professional Communication

The Theory and Practice of Professional Communication (TPPC) program is designed to meet the interests and needs of students who aspire to conduct advanced study of and research into the communicative practices of organizations and the professions. The program offers the opportunity to study professional communication, technology, and culture in a department with a long history of expertise and achievement in writing and technology. The defining features of this program include opportunities to study and work with advanced communication technologies, to engage in extended fieldwork research experiences, and to pursue a program of study that can largely be tailored to work with different research interests within the field of professional communication. The program prepares students to become academic instructors/researchers in English departments or to move into administrative or research positions in nonacademic workplaces.

The TPPC program has a website providing details about the application process, financial assistance, and graduation requirements. This website may be accessed at: <http://tppc.usu.edu/>

Research

PhD students have opportunities to participate in unique research activities available at facilities associated with the Department of English, such as computer classrooms and labs directed by faculty

members. These research activities complement faculty expertise and curriculum strengths in the department, including workplace-focused graduate research, theory and practice of online education, and training in writing and professional communication.

The TPPC program makes extensive use of Web-based communications systems. The English Department at Utah State has a national reputation for its achievements in online education and continues to develop innovative ways to deliver state-of-the-art, Web-based instruction to students in Utah, across the U.S., and around the world. Depending on their research and teaching interests, TPPC students may be actively involved in these efforts.

Coursework

As part of the work on their degree, students in the program complete a minimum of 60 approved semester credits beyond their master's degree. The required courses include ENGL 7000 (Advanced Research Methods in Professional Communication), ENGL 7410 (Theory and Research in Professional Communication), ENGL 7900 (Research Internship), and ENGL 7970 (Dissertation Research). Additional coursework is completed through a rotating series of seminars focused on the ongoing research projects and interests of faculty. In addition, to support the breadth of perspective required to understand professional communication as it operates in society at large, students are required to take at least 6 credits (and a maximum of 18 credits) of graduate-level coursework outside of the Department of English. Students are encouraged to select courses that will help them develop expertise in an area (either disciplinary or interdisciplinary) that will complement their research and/or pedagogical goals.

Admission Procedure

Applicants for admission to the program must have a master's degree in a subject area that complements their professional reason(s) for earning a PhD in Theory and Practice of Professional Communication. They must also have earned scores *no lower than the 40th percentile* in the Verbal section and in *either* the Quantitative *or* the Analytical section of the Graduate Record Examination (GRE) General Test.

Applicants to the program should send materials to two offices at Utah State University, as described below.

To the **School of Graduate Studies**, applicants should send four items:

1. A completed application form, along with the application fee.
2. Two copies of all official undergraduate and graduate transcripts, showing GPA. The minimum requirement is 3.00 on a 4.00 scale for the last 60 credits of undergraduate courses taken and for all graduate credits taken.
3. Three letters of recommendation (at least two of which must be from former professors if the applicant has been enrolled in school during the last five years).
4. GRE scores no older than five years.

To the **Director of Graduate Studies in the Department of English**, applicants should send four items:

1. A letter of intent providing background information about the applicant's training, interests, and experiences, as well as an

overview of the applicant's career goals and specific reasons why graduate training in professional communication is important to the applicant.

2. A completed *Graduate Instructorship Application for PhD Students* form (indicating whether or not the applicant wishes to be considered for a graduate instructorship).
3. A current vita.
4. Two writing samples (a total of 20-40 pages). The samples may include academic or nonacademic writing, but should demonstrate *both* the applicant's critical *and* research skills. Each sample must be accompanied by a 1-page introductory preface. For additional details, see the TPPC website at: <http://tppc.usu.edu/>

The annual deadline for application to the program is January 15. Applications will be considered *only* if all the required materials have arrived by the deadline, or a formal petition to review a nearly-complete file is made and approved by January 22.

Financial Assistance

Both departmental support and formal research grant support are available to graduate students on a competitive basis. Highly qualified graduate students may also be nominated to compete for University fellowships. Students who wish to be considered for financial aid must meet the application deadlines described above.

Graduate instructorships are available through the Department of English. The assignment will be 50 percent time—approximately 20 hours of work per week. The normal teaching load is two sections of writing classes (e.g., composition or introduction to technical communication) for fall and spring semesters.

In addition, students are normally responsible for paying resident (instate) tuition and fees if they are residents of Utah, and *both* resident and nonresident (out-of-state) tuition and fees if they are *not* Utah residents. However, PhD students who are employed as graduate instructors (or who are recipients of certain fellowships) are eligible for tuition waivers. If they are Utah residents, their resident tuition costs will be waived. If they are *not* Utah residents, *both* the resident and nonresident tuition costs will be waived. Recipients of these tuition waivers will *still* be responsible for paying fees each semester.

Master's Degree Programs

The Department of English offers courses of study leading to the MS and MA degrees in English and in American Studies. Applicants seeking the English degree may be admitted into the Literature and Writing specialization or the Technical Writing specialization. Applicants seeking the interdisciplinary American Studies degree may draw from a combination of courses dealing with American culture: literature, history, art, government, etc. Folklore is one of the specializations in American Studies, with courses in all aspects of folklore study, including public sector folklore.

For a more complete description of the Department of English graduate programs, see the department's website: <http://websites.usu.edu/english/>

Department of English

Admission Requirements

In addition to the requirements specified on pages 93-94 (Admission Procedures), applicants for admission to the English Department master's degree programs should have a BS or BA degree with an undergraduate major in a subject area relevant to the master's program they desire to enter. The English Department accepts the Miller Analogies Test in place of the GRE general test, but encourages applicants to take the GRE. The department also requires a 5-10 page writing sample appropriate to the program the applicant desires to enter. The Technical Writing specialization has additional requirements; see the following website: <http://english.usu.edu/techcomm/>

International applicants from non-English-speaking countries who desire an MS or MA degree in English should have a BS or BA degree in English from an accredited, English-speaking university. Students whose command of written English is not adequate to the demands of writing a graduate thesis in English may be required to take courses in Intensive English or may be counseled to obtain a second bachelor's degree at USU (30 credits minimum).

The annual application deadline is January 15 for those who wish to be considered for a graduate instructor position, a Moyle Q. Rice Scholarship, or other form of financial aid. The final annual deadline is June 1 for all other applicants who wish to begin their course of study fall semester.

Anyone who has not been accepted into a graduate program in the English Department must have permission from the department's Director of Graduate Studies to enroll in English graduate courses.

MA/MS in English Requirements

Applicants will be admitted to the English degree for one of two specializations: Literature and Writing (30-33 credits) or Technical Writing (33 credits).

Literature and Writing

This specialization results from a merger of two previous specializations within the English degree: *Literary Studies* and *Theory and Practice of Writing*. The Literature and Writing specialization is designed to help secondary-level English teachers advance their careers, to prepare students to teach English at two-year colleges, and to prepare students to pursue doctoral studies in English. Students plan their program of study with their advisor, selecting courses primarily from the ENGL 6330 to 6360 range and the ENGL 6820 to 6890 range. Students are encouraged, but not required, to take ENGL 6320 and/or ENGL 6810. In addition, ENGL 6820 (Practicum in Teaching English) is required for all students working as Graduate Instructors. With the approval of the student's advisor, a program of study may also include courses from one of the department's other specializations and one course from another department.

As part of a commitment to exploring the relationship between technology and the humanities, and to accommodate students living beyond commuting distance, the department offers at least one online graduate seminar per semester appropriate for students in the Literature and Writing specialization. There may also be an appropriate online course offered during the summer. These online courses are also open to on-campus students. Students can complete the degree entirely online. However, if they take only online courses, they should expect a limited selection of courses, and they should expect to take longer than two years to graduate.

Students in Literature and Writing may pursue *either* the MS *or* the MA degree, but the department recommends the MA for those planning to continue study at the doctoral level. Literature and Writing students are encouraged to choose *either* Plan A *or* Plan B, both of which require an extended project, which is completed under the supervision of the student's Supervisory Committee and culminates in an oral defense. Plan A consists of 24 credits of coursework and 6 credits of ENGL 6970 (Thesis), leading to a thesis of 60 pages or more; Plan B consists of 27 credits of coursework and 3 credits of ENGL 6970, leading to a mini-thesis. Both Plan A and Plan B projects require the student to meet on campus at least twice with his or her Supervisory Committee. During the first meeting, the student defends a written thesis proposal. During the second meeting, the completed thesis is defended. With the approval of the Creative Writing Committee, a Plan A or Plan B project may consist of a piece of creative writing and an accompanying critical essay. Plan C, which consists of additional coursework (33 credits as opposed to 30 credits for Plan A or B) and no extended project or defense, is also available. Plan C does not require the student to come to campus for defense meetings with the Supervisory Committee, so it is geared especially to students living beyond commuting distance who are taking all or most of their courses online. Students enrolled in all three plans write a Comprehensive Exam.

Technical Writing (online)

Technical Writing is designed for students who already have some training and/or experience as practitioners of technical writing. The program is entirely online, via the Internet. The program's mission is to prepare students to enter or reenter nonacademic workplaces, not just as practitioners, but also as developers and managers of technical documents. When they finish the program, students will be qualified to determine and defend writing policy and practices in their workplaces.

To prepare students for these leadership roles, the program provides them with a strong theoretical understanding of their profession. In their online graduate seminars, students will read widely in research and theory relating to workplace writing practices. They will critically examine both the theories and the practices, and they will explore ways in which each can enhance the other. They will also learn how to manage teams of writers, and they will explore ethical issues in the profession. The program will balance the theoretical training with opportunities for students to improve their own practical skills as technical writers, learning how to apply theory and current technology to the production of a variety of technical documents. This practical training will include multimedia presentations and graphic design.

The program is designed primarily for nontraditional students—working professional writers who want to enhance their credentials and build a strong theoretical understanding of their profession. However, it may also accept some traditional students who have just finished their undergraduate studies.

Students in Technical Writing must complete 33 credits under the Plan C option. Courses may be taken in any sequence. Students in this program pursue the MS degree.

MA/MS in American Studies Requirements

Those applicants who have been admitted to the American Studies degree will work out a program of study with either the American Studies advisor or the Folklore advisor. Generally, students develop their programs with an emphasis in American literature, folklore, or history. Interdisciplinary connections with many other departments at USU are possible. Students may choose the standard program, the

Folklore specialization, or the Public Sector Folklore specialization. The American Studies degree requires 30 credits, with a preference for the MA and the Plan A (thesis) options, although the MS and the Plan B options are also accepted.

Students in the standard program must take ENGL 6600 (American Studies Theory and Method) early in their course of study. Students in the Folklore specialization must take ENGL 6700 (Folklore Theory and Method) early in their course of study. Students selecting the Public Sector Folklore specialization will follow the same requirements as students in the Folklore specialization, with the following exception. All students in the Public Sector Folklore specialization are required to take ENGL 6720 (Folklore Fieldwork), ENGL 6730 (Public Folklore), and ENGL 6900 (Graduate Internship).

Of special interest to students in American Studies are the *Western Historical Quarterly* and the *Western American Literature* journals published at USU, which often provide editorial and clerical positions for graduate students. Also, The Mountain West Center for Regional Studies sponsors lectures and programs and provides research assistance for students working in the field of regional studies. The Merrill Library is a regional depository for federal publications and receives 60,000 to 70,000 government titles each year. The library's Special Collections contain thousands of historical photographs, an immense store of pioneer diaries and papers, and a strong collection of books and manuscripts relating to the west, the pioneers, the Mormons, cowboys, and cowboy poetry. The Fife Folklore Archives, named after Utah folklorists Austin and Alta Fife and recognized as one of the best folklore archives in the country, contains over 3,400 books on folklore and folklore-related topics. The Special Collections also serve as the national depository for the American Folklore Society's Papers, more than 50 linear feet of records and documents accumulated during the 114-year history of the organization.

General Requirements

All candidates for the MS and MA degrees must meet the School of Graduate Studies requirements (see pages 93-101 of this catalog). Only grades of B- or better will be accepted for credits in support of the degree programs; however, students must maintain an overall GPA of 3.0 to remain in the program.

All candidates must complete a comprehensive examination covering the material of their graduate program; however, the nature of this examination varies according to the particular specialization and the advice of the candidate's supervisory committee.

All candidates are required to defend their Plan A thesis or Plan B papers. After successfully defending their Plan A thesis, students must submit a department-approved final draft to the thesis coordinator in the School of Graduate Studies office (Main 164). After successfully defending their Plan B papers, students must submit a department-approved copy to University Library Special Collections (Merrill Library 143).

All candidates who are first-year graduate instructors are required to take ENGL 6820 (Practicum in Teaching English) during their first semester. The candidate's supervisory committee will determine whether ENGL 6820 will be accepted as part of the candidate's graduate program.

Financial Assistance

The Department of English has a limited number of graduate instructor positions and Moyle Q. Rice Scholarships available on a competitive basis for both English and American Studies graduate students. Additional financial aid is available through the journal of *Western American Literature*. All applicants whose application materials are received by January 15 will automatically be considered for possible scholarship awards. All applicants who wish to be considered for a graduate instructorship should contact the Director of Graduate Studies in the English Department. The application deadline for instructorships is January 15.

English Faculty

Professors

Melody Graulich, American Literature, American Studies, Western American literature, feminist studies; editor, *Western American Literature*

Christine Hult, composition and rhetoric, teacher education (Associate Dean, College of Humanities, Arts and Social Sciences)

Joyce A. Kinkead, composition and rhetoric (Vice Provost for Undergraduate Studies and Research)

Lynn L. Meeks, teacher education, composition and rhetoric, literature for children and young adults

Jeffrey Smitten, eighteenth century British literature, Scottish literature, literary theory and criticism

Jeannie B. Thomas, folklore, legend, oral narrative, humor and gender

Professors Emeritus

Jan Bakker, nineteenth- and early twentieth-century American literature

Kenneth W. Brewer, poetry and essay writing

Barre Toelken, folklore, Native American studies, medieval literature

Associate Professors

Paul J. Crumbley, American poetry, nineteenth century American women writers, American identity, the wilderness experience

Kathryn R. Fitzgerald, teacher education, composition and rhetoric, writing assessment

Evelyn I. Funda, American literature, Western American literature

Patricia Gantt, teacher education, young adult literature, American studies, women and gender studies, southern literature

Keith A. Grant-Davie, composition and rhetoric, reading theory, technical communication

David E. Hailey, Jr., technical communication, online information, CBT technology

Phebe Jensen, sixteenth- and seventeenth-century British literature, Shakespeare

Sonia Manuel-Dupont, linguistics, technical communication, teacher education

Brian W. McCuskey, nineteenth-century British literature

John E. McLaughlin, linguistics, technical communication, Native American languages

Kristine A. Miller, twentieth-century British literature

Jan E. Roush, American Studies, folklore

Anne Shifrer, twentieth-century literature, women writers, poetry, literary theory and criticism

Ronald R. Shook, technical communication, linguistics

Stephen C. Siporin, folklore, folk narrative, material culture, folk ethnicity

Mark Zachry, rhetoric and professional communication; editor *Technical Communication Quarterly*

Department of English

Associate Professors Emeritus

Theodore Andra, British literature, technical writing

Kate M. Begnal, twentieth-century literature, postmodernism, literary theory and criticism

Patricia Gardner, world literature, children's and young adult literature, folklore

Assistant Professors

Cheryl E. Ball, computers and writing, new media, visual rhetoric, composition studies, e-poetics

Christopher Cokinos, creative nonfiction, poetry writing, science and nature writing; editor, *Isotopes*

Kelli Cargile Cook, technical communication

Christine F. Cooper, medieval literature, commonwealth

Brock Dethier, composition, creative writing

Lisa Ann Gabbert, folklore, American studies

Ryan M. Moeller, professional writing, rhetorical theory, rhetorics of technology

Jennifer Sinor, rhetoric and composition, teacher education

Michael Sowder, creative writing (poetry), American literature

Roberta S. Stearman, American literature, fiction writing

Andrea Tinnemeyer, American literature

Adjunct Assistant Professor

Christie L. Fox, folklore; Program Coordinator of Honors Program

Senior Lecturer

Nancy O'Rourke, technical communication

Lecturers

Susan Andersen, literature and writing

Shanan L. Ballam, writing, creative writing

Star Coulbrooke, Associate Director of Writing Center

Carey Emmons, literature and writing

John Engler, literature and writing

Nikole Berger Eyre, literature and writing

Julie R. Foust, writing; Director of Rhetoric Associates

Marina L. Hall, Coordinator of Public Relations and Educational Outreach

Charlene A. Hirschi, Director of Writing Center

Susan Nyikos, literature and writing

Robin Parent, American studies, folklore, distance education

Rachel Rich, literature and writing

Paige Smitten, literature and writing

Anne H. Stark, literature and writing

Michael Ward, literature and writing

Karen Baird Woods, literature and writing

Course Descriptions

English (ENGL), pages 509-513

Department of Environment and Society

Department Head: Terry L. Sharik
Location: Natural Resources 201
Phone: (435) 797-1790
FAX: (435) 797-4048
WWW: <http://www.cnr.usu.edu/envs>

Undergraduate Advisor:
Maureen A. Wagner, Natural Resources 120, (435) 797-2448,
maureen@cc.usu.edu

Degrees offered: Bachelor of Science (BS) in Environmental Studies; BS, Master of Science (MS), and Doctor of Philosophy (PhD) in Recreation Resource Management; BS, Bachelor of Arts (BA), MS, and Master of Arts (MA) in Geography; MS in Bioregional Planning (offered jointly with Department of Landscape Architecture and Environmental Planning); MS and PhD in Human Dimensions of Ecosystem Science and Management

Vision/Mission: The vision of the Department of Environment and Society is one of bringing people and science together for healthy communities and enduring ecosystems. The mission of the department is based on three goals: (1) to promote scholarship and creativity in the discovery, synthesis, and transfer of knowledge relating to the human dimensions of natural resource and environmental management; (2) to apply social science concepts and approaches to better understand human-environment interactions at a range of spatial scales; and (3) to enhance the effectiveness of policies, planning, and administrative processes that affect sustainable use of the natural world.

To this end, the department's academic programs provide undergraduate and graduate students with a balanced exposure to the social, physical, and biological sciences within an interdisciplinary framework. This combination has great relevance for students aspiring to careers in natural resource and environmental policy, planning, management, education, and science, as well as careers in geography. The program is designed to provide students with a working knowledge of the human aspects of ecosystems and a speaking knowledge of the biophysical aspects, as well as experience using "state of the art" tools and techniques for integrating this knowledge.

Undergraduate Programs

Objectives

The department offers the following undergraduate degree programs: Environmental Studies, Geography, and Recreation Resource Management. Each of these programs offers a balanced exposure to key ideas and principles of the social, biological, and physical sciences, placing special emphasis on the human dimensions of natural resources and environmental management. The department's goal is to train professionals who can lead the way toward finding and keeping a sustainable balance between protecting the environment and enhancing human societies.

Departmental programs offer learning experiences in the classroom and in the field, frequent individual contacts with faculty as teachers and advisors, and opportunities to take part in student and professional organizations. Seasonal employment, internships, and other activities promoting hands-on experience in natural resource and geographic professions are strongly encouraged.

The **Environmental Studies** curriculum is designed for students who wish to acquire a broad understanding of natural resources and human-environment relationships, together with the technical

background needed to understand environmental issues. In many ways, the curriculum provides a traditional "liberal arts education" with a strong natural resources emphasis. Moreover, it offers flexibility for the development of either specialization or breadth of content to match the student's interests.

The **Geography** curriculum provides a broad background in the basic themes of geography—human (cultural), physical, and regional geography—with a particular focus on environmental and earth resources geography. In addition, students acquire technical geographic analysis skills. Students also have the opportunity to study in a systematic, regional, or technical area of geography.

The **Geography Teaching** curriculum offers students an opportunity to prepare for a career in secondary education with a geography emphasis.

The **Recreation Resource Management** curriculum prepares students for careers in managing outdoor recreation settings, such as public forests and rangelands, state and national parks, and wilderness areas. Because these jobs require an understanding of both the land and the people who visit it, the major offers courses in both the natural and social sciences, along with an emphasis on communication skills.

Requirements

Admission Requirements

Admission requirements for the Department of Environment and Society are the same as those described for the College of Natural Resources (see pages 117-118).

Graduation Requirements

All courses listed as major subject courses must be taken on an *A-B-C-D-F* basis. The grade point average for all courses taught by the College of Natural Resources must be 2.5 or higher.

All students in the Environmental Studies and Recreation Resource Management majors must complete a series of basic lower-division courses providing the disciplinary foundation for natural resource professions before moving on to professional coursework. Equivalents of these foundation courses may be taken at many two- and four-year colleges. Some foundation and core courses may also be used toward the University Studies requirements, as shown by the University Studies designations listed in parentheses following the course numbers. Students should consult their academic advisor if they have questions about University graduation requirements.

Environmental Studies Major

The Environmental Studies major consists of 92 credits. This total includes the disciplinary foundation, professional courses, and a specialization option of 15 or more credits.

A. Disciplinary Foundation (18 credits)

BIOL 1010 (BLS) Biology and the Citizen (F,Sp)	3
BIOL 1020 Biological Discovery: A Lab Course (Sp)	1
CHEM 1110 (BPS) General Chemistry I (F,Sp)	4
HIST 3950 (DHA/CI) Environmental History (Sp) (3 cr) or	
PHIL 3510 (DHA) Environmental Ethics (Sp) (3 cr)	3
MATH 1050 (QL) College Algebra (F,Sp)	4
STAT 2000 (QI) Statistical Methods (F,Sp)	3

B. Professional Coursework (51-55 credits)

AWER 3100 (DSC/CI) Fish Diversity and Conservation (F) (3 cr) or	
ENVS 3600 (DSC) Living with Wildlife (Sp) (3 cr)	3

Department of Environment and Society

AWER 3700 (CI) Fundamentals of Watershed Science (Sp).....	3
ENVS 1990 Professional Orientation for Environment and Society (F).....	2
ENVS 2340 (BSS) Natural Resources and Society (F,Sp).....	3
ENVS 3000 Natural Resources Policy and Economics (F).....	4
ENVS 3330 Environment and Society (Sp).....	3
ENVS 3500 (QI) Quantitative Assessment of Environmental and Natural Resource Problems (F).....	3
ENVS 4000 Human Dimensions of Natural Resource Management (F).....	3
ENVS 4400 Economic Applications in Natural Resource Management (Sp).....	4
ENVS 4990 Environmental and Natural Resource Professionalism Seminar (F).....	2
ENVS 5000 Collaborative Problem-Solving for Environment and Natural Resources (Sp).....	3
FRWS 2200 (BLS) Ecology of Our Changing World (F,Sp).....	3
FRWS 3900 Managing Dynamic Ecological Systems (Sp).....	4
GEOG 1130 (BPS) Physical Geography (F,Sp) (3 cr) or GEOL 1150 (BPS) The Dynamic Earth: Physical Geology (F,Sp) (4 cr).....	3 or 4
GEOG 3850 Map, Air Photo, and GIS Interpretation (F).....	4

Choose one of the following courses (2-3 credits):

ENVS 4110 Fisheries and Wildlife Policy and Administration.....	3
ENVS 4130 Recreation Policy and Planning.....	3
ENVS 5300 Natural Resources Law and Policy.....	2
ENVS 5320 Water Law and Policy in the United States.....	3
ENVS 5550 Environment, Resources, and Development Policy.....	3
ENVS 5640 Conflict Management in Natural Resources.....	3
Another course related to natural resource or environmental policy, numbered 3000 or higher, approved by faculty advisor.....	2-3

Choose one of the following courses (3-4 credits):

BIOL 3040 (DSC) Plants and Civilization (F).....	3
FRWS 3600 Wildland Plant Ecology and Identification (F).....	4
PLSC 3500 The Structure and Function of Economic Crop Plants (Sp).....	3

C. Specialization Option (15 credits)

Each student, working jointly with his or her faculty advisor, designs a "specialization option" that includes at least 15 additional credits fitting his or her own interests and career goals, and which gives training beyond the required courses in the major. For example, one student may choose to focus on environmental business and marketing, another on international rural development, and a third on natural resource and environmental policy. Typically these courses are taken during the senior year, but a student should meet with his or her advisor to develop and gain approval for the option *no later* than midway through the second semester of the junior year. Courses in the option may be chosen from any offered at the University. Examples of these specializations can be found at:

<http://www.cnr.usu.edu/envs>

D. Electives (32-36 credits)

Students may take the remainder of the 120 credits from any department. The guidelines described previously under "Breadth Requirements" and "Depth Education Requirements" should be consulted to ensure meeting University Studies Requirements.

Environmental Studies Minor (15-17 credits)

The Environmental Studies minor is open to all majors except those in the College of Natural Resources. Students wishing to minor in Environmental Studies should contact the Department of Environment and Society to meet with the department's designated minor advisor.

All courses required for the minor must be taken on an *A-B-C-D-F* basis. A minimum GPA of 2.5 is required for courses taken to complete the minor.

A. Required Courses (10 credits)

ENVS 2340 (BSS) Natural Resources and Society (F,Sp).....	3
ENVS 3000 Natural Resources Policy and Economics (F).....	4
FRWS 2200 (BLS) Ecology of Our Changing World (F,Sp).....	3

B. Electives (5-7 credits)

Select one of the following courses in natural resources policy or economics:

ENVS 4110 Fisheries and Wildlife Policy and Administration (F).....	3
ENVS 4130 Recreation Policy and Planning (Sp).....	3
ENVS 4400 Economic Applications in Natural Resource Management (Sp).....	4
ENVS 5300 Natural Resources Law and Policy (F).....	2
ENVS 5320 Water Law and Policy in the United States (F).....	3
ENVS 5550 Environment, Resources, and Development Policy (Sp).....	3

Select one additional upper-division (3000-level or higher) course of 3 credits or more, which provides greater depth in an area of natural or social sciences that can be applied to the management of natural resources and the environment, to be selected in consultation with the Environmental Studies minor advisor.

Geography Major

The Geography major consists of 48 credits. After meeting the University Studies, USU upper-division, and geography major requirements, students may take the remainder of their 120 required credits in any discipline from any department. Students interested in using their elective credits to develop a field of specialization should consult with their advisor to select appropriate courses.

A. Disciplinary Foundation Courses (29 credits)

AWER 4930 Geographic Information Systems (F).....	4
ENVS 1990 Professional Orientation for Environment and Society (F).....	2
ENVS 5000 Collaborative Problem-Solving for Environment and Natural Resources (Sp).....	3
GEOG 1030 (BSS) World Regional Geography (F).....	3
GEOG 1130 (BPS) Physical Geography (F, Sp, Su).....	3
GEOG 1140 Physical Geography Lab (F,Sp).....	1
GEOG 2030 (BSS) Human Geography (Sp).....	3
GEOG 3850 Map, Air Photo, and GIS Interpretation (F).....	4
GEOG 4200 (CI) Regional Geography (F, Sp, Su).....	3
GEOG 4850 Cartographic Design (Sp).....	3

B. Quantitative Foundation (7 credits)

MATH 1050 (QL) College Algebra (F, Sp).....	4
STAT 2000 (QI) Statistical Methods (F, Sp).....	3

C. Geography Specialization (12 credits)

Students work with their faculty advisor to develop a 12-credit specialization fitting their interests and career goals. The specialization may include internships, directed study, and courses offered throughout the University that complement their academic goals.

Geography Minor (24 credits minimum)

AWER 4930 Geographic Information Systems (F).....	4
GEOG 1030 (BSS) World Regional Geography (F).....	3
GEOG 1130 (BPS) Physical Geography (F,Sp,Su).....	3
GEOG 1140 Physical Geography Lab (F,Sp).....	1
GEOG 2030 (BSS) Human Geography (Sp).....	3

Department of Environment and Society

GEOG 3850 Map, Air Photo, and GIS Interpretation (F).....	4
GEOG 4200 (CI) Regional Geography (F,Sp,Su).....	3
GEOG 4850 Cartographic Design (Sp).....	3

Geography Teaching Major (41 credits minimum)

The teaching major in Geography consists of both the geography courses (41 credits minimum), plus the Secondary Teacher Education Program (STEP) (35 credits). **A 2.75 or higher overall cumulative GPA in 90 credits is required for admission to the STEP. The 2.75 minimum overall cumulative GPA must be maintained for graduation.**

A. Geography Teaching Major Foundation Courses (27-28 credits)

ENVS 1990 Professional Orientation for Environment and Society (F).....	2
ENVS 5000 Collaborative Problem-Solving for Environment and Natural Resources (Sp).....	3
GEOG 1030 (BSS) World Regional Geography (F).....	3
GEOG 1130 (BPS) Physical Geography (F, Sp, Su).....	3
GEOG 2030 (BSS) Human Geography (Sp).....	3
GEOG 3850 Map, Air Photo, and GIS Interpretation (F).....	4
GEOG 4200 (CI) Regional Geography (Utah) (Sp).....	3
GEOG 4200 (CI) Regional Geography (International Course) (F, Sp, Su).....	3
GEOG 4850 Cartographic Design (Sp) (3 cr) or	
AWER 4930 Geographic Information Systems (F) (4 cr).....	3 or 4

B. Geography Education Pedagogical Methods Courses (4 credits)

GEOG 4300 Geography Education Classroom Practicum (F, Sp, Su).....	1
GEOG 4800 Teaching Geography (F).....	3

C. Geography Education Elective Courses (9-10 credits)

Students may select the remaining 9-10 credits in Geography from courses numbered 2000 and above. It is recommended that students take additional regional, physical, human, human-environment interaction techniques, technology in geography education, or classroom technology practicum credits. All electives must be coordinated with a geography education advisor.

D. Teaching Minor

A teaching major in Geography also requires an approved teaching minor from another field of study acceptable to the Secondary Education Department.

Teaching Minor in Geography (23 credits minimum)

Note: A teaching minor in Geography **requires** an approved teaching major in another subject.

A. Geography Teaching Minor Foundation Courses (18-19 credits)

GEOG 1030 (BSS) World Regional Geography (F).....	3
GEOG 1130 (BPS) Physical Geography (F,Sp,Su).....	3
GEOG 2030 (BSS) Human Geography (Sp).....	3
GEOG 4200 (CI) Regional Geography (Utah) (Sp).....	3
GEOG 4200 (CI) Regional Geography (International Course) (F,Sp,Su).....	3
GEOG 3850 Map, Air Photo, and GIS Interpretation (F) (4 cr) or	
GEOG 4850 Cartographic Design (Sp) (3 cr) or	
AWER 4930 Geographic Information Systems (F) (4 cr).....	3 or 4

B. Geography Education Courses (4 credits)

GEOG 4300 Geography Education Classroom Practicum (taken with GEOG 4800) (F,Sp,Su).....	1
GEOG 4800 Teaching Geography (F).....	3

C. Geography Electives (1-2 credits)

Secondary Teacher Education Program (STEP) (35 credits)

Students must complete three levels in the STEP. All three levels of the STEP will be offered during fall and spring semesters, *not* during summers. Levels of the STEP are taken as a package, not piecemeal. Each level must be satisfactorily completed before a student is advanced to the next level. All courses must be completed with a minimum grade of C-. **Prior to admission to the STEP, students in the Geography Teaching Major must complete MATH 1050, unless their Math ACT score is 25 or higher.**

Students should consult with advisors in major and minor departments for scheduling of special methods classes at Levels 1 and 2.

Although certain combinations of majors and minors require three special methods classes, only *two* clinical experiences (total) should be scheduled at Levels 1 and 2. These in-school experiences are coordinated by methods instructors.

A. Level 1 (15-week courses) (11 credits minimum)

INST 3500 Technology Tools for Secondary Teachers (F,Sp,Su).....	1
SCED 3100 Motivation and Classroom Management (F,Sp).....	3
SCED 3210 (CI/DSS) Educational and Multicultural Foundations (F,Sp).....	3
Clinical Experience I (30 hrs. minimum) (3300 in various departments).....	1
One or more methods courses in major (3-6 credits in minor—Social Studies Education).....	3

B. Level 2 (15-week courses) (12 credits minimum)

SPED 4000 Education of Exceptional Individuals (may be taken anytime) (F,Sp,Su).....	2
SCED 4200 (CI) Reading, Writing, and Technology (F,Sp).....	3
SCED 4210 Cognition and Evaluation of Student Learning (F,Sp).....	3
Clinical Experience II (30 hrs. minimum) (4300 in various departments).....	1
Special Methods II (major or minor) (taught in various departments).....	3

C. Level 3 (includes 13 weeks of student teaching and 2 weeks of Student Teaching Seminar) (12 credits)

SCED 5500 Student Teaching Seminar (2 weeks) (F,Sp).....	2
SCED 5630 Student Teaching in Secondary Schools (13 weeks, full-time) (F,Sp).....	10

Recreation Resource Management Major

The Recreation Resource Management major consists of 82-86 credits.

A. Disciplinary Foundation (15 credits)

BIOL 1010 (BLS) Biology and the Citizen (F,Sp).....	3
BIOL 1020 (BPS) Biological Discovery: A Lab Course (Sp).....	1
CHEM 1110 (BPS) General Chemistry I (F,Sp).....	4
MATH 1050 (QL) College Algebra (F,Sp).....	4
STAT 2000 (QI) Statistical Methods (F,Sp).....	3

B. Professional Coursework (67-71 credits)

AWER 3100 (DSC/CI) Fish Diversity and Conservation (F) (3 cr) or	
ENVS 3600 (DSC) Living with Wildlife (Sp) (3 cr).....	3

Department of Environment and Society

AWER 3700 (CI) Fundamentals of Watershed Science (Sp).....	3
ENVS 1990 Professional Orientation for Environment and Society (F).....	2
ENVS 2340 (BSS) Natural Resources and Society (F,Sp).....	3
ENVS 3000 Natural Resources Policy and Economics (F).....	4
ENVS 3300 Fundamentals of Recreation Resources Management (F).....	3
ENVS 3500 (QI) Quantitative Assessment of Environmental and Natural Resource Problems (F).....	3
ENVS 4000 Human Dimensions of Natural Resource Management (F).....	3
ENVS 4130 Recreation Policy and Planning (Sp).....	3
ENVS 4400 Economic Applications in Natural Resource Management (Sp).....	4
ENVS 4500 (CI) Wildland Recreation Behavior (F).....	3
ENVS 4600 Natural Resource Interpretation (F) (3 cr) or	
ENVS 5110 Environmental Education (Sp) (3 cr).....	3
ENVS 4920 Special Projects in Recreation Management (F,Sp,Su).....	3
ENVS 4990 Environmental and Natural Resource Professionalism Seminar (F).....	2
ENVS 5000 Collaborative Problem-Solving for Environment and Natural Resources (Sp).....	3
FRWS 2200 (BLS) Ecology of Our Changing World (F,Sp).....	3
FRWS 3900 Managing Dynamic Ecological Systems (Sp).....	4
GEOG 1130 (BPS) Physical Geography (F,Sp) (3 cr) or	
GEOL 1150 (BPS) The Dynamic Earth: Physical Geology (F,Sp) (4 cr).....	3 or 4
GEOG 3850 Map, Air Photo, and GIS Interpretation (F).....	4
SOIL 3000 Fundamentals of Soil Science (F,Sp).....	4

Choose one of the following courses (3-4 credits):

BIOL 3040 (DSC) Plants and Civilization (F).....	3
FRWS 3600 Wildland Plant Ecology and Identification (F).....	4
PLSC 3500 The Structure and Function of Economic Crop Plants (Sp).....	3

Choose one of the following courses (1-3 credits):

ANTH 3110 North American Indian Cultures (F).....	3
ANTH 4110 Southwest Indian Cultures, Past and Present (F).....	3
Other course(s) approved by student's department.....	1-3

C. Electives (34-38 credits)

Students may take the remainder of the 120 credits from any department. The guidelines described previously under "Breadth Requirements" and "Depth Education Requirements" should be consulted to ensure meeting University Studies Requirements.

Recreation Resources Minor (15 credits)

Students wishing to minor in Recreation Resources should contact the Department of Environment and Society to meet with the department's designated minor advisor. All courses required for the minor must be taken on an *A-B-C-D-F* basis. A minimum GPA of 2.5 is required for courses taken to complete the minor.

A. Required Courses (12 credits)

ENVS 3300 Fundamentals of Recreation Resources Management (F).....	3
ENVS 4130 Recreation Policy and Planning (Sp).....	3
ENVS 4500 (CI) Wildland Recreation Behavior (F).....	3
ENVS 4600 Natural Resource Interpretation (F).....	3

B. Elective Course (3-4 credits)

Select *one* of the following courses:

ENVS 3330 Environment and Society (Sp).....	3
ENVS 4000 (DSS) Human Dimensions of Natural Resource Management (F).....	3

ENVS 4400 Economic Applications in Natural Resource Management (Sp).....	4
ENVS 5110 Environmental Education (Sp).....	3

Environment and Society Minors

The department offers minors in Environmental Studies, Geography, Geography Teaching, and Recreation Resources. Students in all University majors may complete a Geography, Geography Teaching, or Recreation Resources minor. The Environmental Studies minor is open to all majors, *except* those in the College of Natural Resources. Because the same courses cannot be counted toward both a student's major and minor, students must take additional courses beyond those listed here if their majors require courses that are also included in the minor. Students wishing to minor in the above areas should contact the department to meet with the designated advisor for that minor.

Financial Assistance

The main opportunities for undergraduates to find financial support through grants, work-study, and loans are listed on pages 23-27 in the *Financial Aid and Scholarship Information* section. Some students may be able to find paid internships with private or governmental organizations, or work for a faculty member on a research project. Interested persons should contact the College of Natural Resources Academic Service Center for more information on scholarships for undergraduate students.

Departmental Honors

Students who would like to experience greater academic depth within their major are encouraged to enroll in departmental honors. Through original, independent work, Honors students enjoy the benefits of close supervision and mentoring, as they work one-on-one with faculty in select upper-division departmental courses. Honors students also complete a senior project, which provides another opportunity to collaborate with faculty on a problem that is significant, both personally and in the student's discipline. Participating in departmental honors enhances students' chances for obtaining fellowships and admission to graduate school. Minimum GPA requirements for participation in departmental honors vary by department, but usually fall within the range of 3.30-3.50. Students may enter the Honors Program at almost any stage in their academic career, including at the junior (and sometimes senior) level. The campus-wide Honors Program, which is open to all qualified students regardless of major, offers a rich array of cultural and social activities, special classes, and the benefit of Honors early registration. Interested students should contact the Honors Program, Merrill Library 374, (435) 797-2715, honors@cc.usu.edu. Additional information can be found online at: <http://www.usu.edu/honors/>

Additional Information

For additional information about the Bachelor of Science requirements, course sequencing, and departmental specialization options and their related coursework, as well as updated information describing current programs and courses offered by the Department of Environment and Society, visit the Environment and Society main office, Natural Resources 201, or visit: <http://www.cnr.usu.edu/envs>

Major requirement sheets, which outline career opportunities and required courses for departmental majors, can be obtained from the department, or online at: <http://www.usu.edu/ats/majorsheets/>

Department of Environment and Society

Graduate Programs

Admission Requirements

See general admission requirements on pages 93-94. Applicants for graduate study in the Department of Environment and Society should have a bachelor's degree from an accredited college or university, a cumulative GPA of at least 3.0 (out of 4.0), and GRE scores (quantitative and verbal) above the 40th percentile. Foreign students should submit a TOEFL score of at least 550. Exceptions to these standards will be considered on a case-by-case basis. Written statements of interest help match applicants with faculty advisors. A faculty member must agree to serve as the major professor in order for an applicant to be accepted. Prospective students are encouraged to contact faculty members early in the application process to investigate mutual interests, projects, and prospects for financial support.

The department's graduate programs focus on providing students with a broad foundation in the social and natural sciences as they relate to the study, planning, and management of ecosystems. The curriculum is designed to enhance interdisciplinary integration by emphasizing current and future environmental issues facing humanity. Coursework and research are focused on problem solving through application of social research methods, case studies, computer mapping, and other analytical techniques.

The department values intellectual, academic, and social diversity in the applicants for graduate study. Mature professionals seeking education to augment life experiences, or practical training to pursue new career paths, are also encouraged to apply. Knowledge gaps will be identified early in a student's program and addressed on a case-by-case basis through agreements between students and their graduate advisory committees.

Degree Programs

The department offers opportunities for graduate study through the MS, MA, PhD, and graduate certificate programs listed below.

The MS degree requires a minimum of 30 credits, of which 24 must be in residence. Candidates for the MA must complete the requirements for the MS, with the addition of at least two years (approximately 16 credits) of an approved foreign language or some other demonstration of foreign language proficiency. There are two options available in both the MS and MA programs. The **Plan A** requires students to complete coursework, as well as a research thesis. The **Plan B** is a nonthesis, terminal degree, based largely on coursework and a professional paper or project.

For the PhD degree, there is a more variable amount of required coursework, as well as a research dissertation. Compared to the MS degree, the PhD degree has a greater emphasis on theory, research methods, writing research proposals, and publishing research in peer-reviewed outlets.

Bioregional Planning

Bioregional Planning is aimed at students focused on how the biophysical attributes of a region influence the human dimensions of culture and settlement and the reciprocal of this. Offered jointly with the Department of Landscape Architecture and Environmental Planning, the program has an interdisciplinary core of courses that provides the background for addressing complex issues in the areas of environmental analysis, planning, and policy. Employment is available in both the private and public sectors, wherever there is emphasis on large-scale planning and management.

Geography and Geography Teaching

Geography and Geography Teaching is geared for students interested in exploring the availability and location of the earth's natural resources, the physical and cultural processes that occur at the earth's surface, and the spatial interactions among components of human society and the biophysical environment. Career opportunities are available in both the private and public sectors in such areas as business, planning, resource and economic development, environmental assessment, and education.

Recreation Resource Management

Recreation Resource Management is aimed at students interested in managing outdoor recreation settings, such as public forests and rangelands, state and national parks, and wilderness areas. An understanding of both the land itself and the people who visit these areas is required. Opportunities are available to work as environmental interpreters, recreation planners, park rangers, trail crew supervisors, ski area employees, visitor center directors, wilderness rangers, and similar occupations. Graduate study provides additional opportunities for research and teaching in higher education, as well as in the private and government sectors.

Human Dimensions of Ecosystem Science and Management

These degrees are the first of their kind in the country. They are aimed at students who desire to be problem-solvers with an ability to integrate the human and biophysical aspects of ecosystems, and to analyze policies and decisions that encourage sustainability of human communities and ecosystems. The MS degree prepares students for professional practice in natural resources and environmental planning and management, policy and program analysis, public affairs, environmental education, community assessment and collaboration, conflict management, and extension/outreach. The PhD program places a greater emphasis on basic theory and research methods in one or more social science disciplines, and thus prepares students for university teaching, research, and extension; for conducting agency and private organizational research; and for positions in formal policy and program evaluation.

Natural Resources (MNR)

The MNR is a nonthesis master's degree program designed for students and practicing professionals seeking advanced training in natural resource management, with an emphasis on collaboration and interdisciplinary teamwork. Employment is available in both the private and public sectors, in positions where management skills are of paramount importance.

Graduate Certificates

The **National Environmental Policy Act (NEPA)** program offers training at the graduate level related to the National Environmental Policy Act, including how to manage the NEPA process and write effective NEPA documents, reviewing NEPA documents, environmental risk communication, environmental compliance, interdisciplinary team-building, environmental contracting, cumulative impact analysis and documentation, conflict management, and socio-economic impact analysis. The certificate leads to careers in federal natural resource agencies, typically as a member of planning teams, where NEPA expertise is critical to decision-making regarding alternative uses of the land.

The **Natural Resource and Environmental Education (NREE)** program provides graduate students with a comprehensive education for understanding and communicating natural resources and

Department of Environment and Society

environmental information, and for developing the analytical skills needed to effectively implement appropriate environmental education and communication techniques for varying audiences. Careers are available with land management agencies; in the education sector—both formal (K-12 school-based) and nonformal (youth, community, and outdoor); in nonprofit organizations; and in the for-profit commercial sector.

Internships

Students are encouraged to undertake one or more internships with various agencies and organizations, as a means of exploring various career possibilities.

Research

The generation of new knowledge through research is one of the key contributions that an academic department makes to professions and society at large. Research is also a major venue for the interaction of graduate students and faculty in the Department of Environment and Society. Although faculty and students work on many different issues, the research strives to be interdisciplinary and focuses on merging the relevant social and natural sciences. Work is undertaken in Utah and beyond, including several projects elsewhere in the United States and in developing nations. Funding comes from a variety of public and private sources. The department houses one institute and three programs that also collaborate on research. These include the Institute for Outdoor Recreation and Tourism, the Natural Resource and Environmental Policy Program, the Geographic Education Program, and the Environmental Education Program.

Financial Assistance

General aspects of financial support for graduate students at Utah State University are listed on pages 92-93 in the *Graduate Financial Assistance* section. This includes important information on the University-wide policies and terms of reference for research and teaching assistantships, graduate tuition obligations and benefits, Western Regional Graduate Programs, and competitive University-wide fellowships and scholarships.

The Department of Environment and Society intends that all graduate students be financially supported. Graduate research assistantships are available through major professors having contracts, grants, or other awards. Internships may also be created on a case-by-case basis. A student may want to author or co-author a proposal with a faculty member to fund a new initiative. There are also open competitions for graduate scholarships and fellowships through the College of Natural Resources. The department also has a few graduate teaching assistantships where graduate students typically help instructors with teaching, grading, or recitation in large courses. Interested persons should contact the department early in the application process for more information on financial assistance for graduate students. Prospective students may also visit: <http://www.cnr.usu.edu/envs>

Environment and Society Faculty

Professors

Clifford B. Craig, human geography, geographic education, rural/urban planning and development, geography of Utah, GIS education
Steven E. Daniels, natural resource policy and sociology
Leona K. Hawks, green consumerism, resource conservation and efficiency, human impacts on the environment
James J. Kennedy, organizational behavior, forest economics

Richard S. Krannich, natural resource sociology and policy
Jack M. Payne, Vice President and Dean for University Extension, conservation program administration, agriculture and natural resource policy
H. Charles Romesburg, environmental decision making, natural resource research methods and survey sampling, bioethics
Terry L. Sharik, academic administration and leadership, teaching and learning pedagogy, forest ecology
Derrick J. Thom, cultural geography, international rural development, land use planning, Africa
Richard E. Toth, bioregional planning and water resources management

Adjunct Research Professor

Leila McReynolds Shultz, plant taxonomy and geography

Associate Professors

Ted J. Alsop, physical geography, university pedagogy, photogrammetry
Dale J. Blahna, natural resource/community social science, outdoor recreation, policy
Mark W. Brunson, environmental knowledge, attitudes and behavior, outdoor recreation
Steven W. Burr, outdoor recreation, nature-based tourism
Christopher A. Conte, African, environmental history
D. Layne Coppock, range ecology and management, international development, systems analysis
Joanna L. Endter-Wada, natural resource and environmental policy, interdisciplinary social sciences, water management and planning
Robert J. Lilieholm, natural resource economics and management, international protected areas
Robert H. Schmidt, wildlife policy and human dimensions, wildlife damage management

Adjunct Associate Professors

Christopher Call, vegetation manipulation/management
Thomas C. Edwards, Jr., Utah Cooperative Fish and Wildlife Research Unit, spatial
R. Douglas Ramsey, remote sensing, geographic information systems, landscapes

Assistant Professor

Nicole L. McCoy, natural resource economics and policy

Research Assistant Professor

Theresa L. Selfa, sociology of environment and development, rural development

Adjunct Assistant Professors

David T. Anderson, Project Director Utah Botanical Center
Benny Bobowski, wildlife biology, rangeland ecology, ecosystem management
Paul W. Box, geographic information systems, spatial analysis and modeling
Michael F. Harper, Latin America, educational technology, geography education
Tamsin C. McCormick, physical geology, land management, environmental education, habitat restoration
Nancy O. Mesner, water quality extension specialist, water policy and modeling

Senior Lecturer

Michael F. Butkus, recreation resources management and planning, interpretive planning

Department of Environment and Society

Lecturers

Benjamin D. Baldwin, Tehabi Project Leader, internship development, leadership and teamwork

Judith A. Kurtzman, natural resource policy

Barbara Middleton, environmental education

Adjunct Lecturers

Kerry F. Case, Utah House Program Coordinator, extension agent, rhetoric, resource conservation and efficiency

Catherine A. "Kate" Stephens, Program Coordinator of Utah Conservation Corps, environmental education

Course Descriptions

Environment and Society (ENVS), pages 514-516

Geography (GEOG), pages 525-526

National Environmental Policy Act (NEPA), page 565

Department of Family, Consumer, and Human Development

Department Head: Thomas R. Lee

Location: Family Life 203

Phone: (435) 797-1551

FAX: (435) 797-3845

E-mail (undergraduate): janiswinkler@cc.usu.edu

E-mail (graduate): teresab@cc.usu.edu

WWW: <http://www.usu.edu/fchd>

Associate Department Head and Adele and Dale Young Child Development Laboratory Director:

Shelley L. Knudsen Lindauer, Family Life 106A,
(435) 797-1532, lindauer@cc.usu.edu

Gerontology Certificate Program Coordinator:

Jana Darrington, Family Life 218, (435) 797-7140,
jdarrington@cc.usu.edu

Marriage and Family Therapy Program Director:

Scot M. Allgood, Family Life Center 207, (435) 797-7433,
allgood@cc.usu.edu

Undergraduate Academic Advisor:

Marilyn B. Kruse, Family Life 205A, (435) 797-1530,
marilynkr@cc.usu.edu

Graduate Program Coordinator:

Kathleen W. Piercy, Family Life 219, (435) 797-2387,
kathyp@cc.usu.edu

Degrees offered: Bachelor of Science (BS), Bachelor of Arts (BA), Master of Science (MS), and Doctor of Philosophy (PhD) in Family, Consumer, and Human Development; BS and BA in Early Childhood Education; BS and BA in Family and Consumer Sciences; Master of Family and Human Development (MFHD)

Undergraduate emphases: *BS, BA in Family, Consumer, and Human Development*—Deaf Education, Family and Community Services, Family Finance; Human Development; *BS, BA in Early Childhood Education*—licensure, K-3rd grades

Graduate specializations: *MS*—Adolescence and Youth, Adult Development and Aging, Consumer Sciences, Infancy and Childhood, Marriage and Family Relationships, Marriage and Family Therapy

Gerontology Certificate Program: The Gerontology Certificate Program at Utah State University is administered through the Department of Family, Consumer, and Human Development, and is open to all majors. Students preparing for careers in the field of aging complete selected aging-related coursework, including a supervised field practicum in a gerontological setting. For a list of requirements for this interdisciplinary certificate, contact the department. A minimum GPA of 2.75 is required for the Gerontology Certificate.

Undergraduate Programs

Objectives

The Family, Consumer, and Human Development Department offers undergraduate programs in Family, Consumer, and Human Development; Family and Consumer Sciences; and Early Childhood Education. All programs are designed to prepare students for successful careers.

The Family, Consumer, and Human Development major prepares students for careers serving individuals and families across the life span. Through classroom study and applied experiences, majors study

how human development, family relationships, family economics, and consumer issues affect the individual and family.

Faculty members provide instruction and practicum supervision to prepare students to meet the needs of the people they will serve in their future careers. Students are then prepared to work in agencies and organizations serving individuals from infancy through later life, as well as families and consumers in many settings.

Student majors in Family, Consumer, and Human Development are required to complete a practicum experience, which is arranged with the department practicum coordinator. Types of practicum sites include state agencies, hospitals, preschools and child care centers, nursing homes, senior citizen centers, parenting programs, detention centers, crisis intervention programs, public schools, Head Start programs, and after-school programs, as well as financial institutions, credit counseling services, and housing services. Practicum experience in the Deaf Education and Human Development emphases includes the Adele and Dale Young Child Development Laboratory setting. Students majoring in Early Childhood Education complete a formal internship in the Adele and Dale Young Child Development Laboratory and in primary school grades as part of this focus.

Majors in Family, Consumer, and Human Development (FCHD), Family and Consumer Sciences (FCS), and Early Childhood Education (ECE), receive the necessary preparation for graduate study in a family, consumer, and human development related field or employment. Early Childhood Education majors acquire a teaching license so they can also teach in grades K-3 in the public schools.

In addition to preparation for advanced study or job opportunities, FCHD majors receive increased knowledge and skills in topics which will enhance their personal and family lives.

Certified Family Life Educator (CFLE)

Students who complete the Family and Community Services emphasis are eligible to apply for the Certified Family Life Educator credential through the National Council on Family Relations.

Gerontology Certificate

Students pursuing the Gerontology Certificate must take additional courses and complete a gerontology practicum as required for certification. A complete list of requirements may be obtained in Family Life 214 or by calling (435) 797-7140.

Departmental Requirements for Family, Consumer, and Human Development Major

Admission Requirements

Students with less than 24 semester credits can declare a premajor in FCHD. Completion of at least 24 semester credits (including FCHD 1100, 1500, and 2400) with a cumulative GPA of 3.0 is required for admission into the Family and Community Services, Human Development, and Deaf Education emphases. Family Finance premajor courses include FCHD 1100, 1500, 2400, and 2450. A cumulative GPA of 3.0 is required.

Departmental Program Requirements

The department has established the following regulations, which govern students' academic progress:

1. The *P/D+*, *D*, and *F* option cannot be used for courses required in the FCHD major or minor.

Department of Family, Consumer, and Human Development

- An overall cumulative GPA of 3.0 is required to enter the major, and a cumulative 3.0 GPA is required for graduation. A GPA of 3.0 in FCHD major courses is also required for graduation.
- Ten-year Policy.** Courses which are required for the major will be accepted if they have been completed within the last 10 years.

Background Check

All students will be required to pass a background check prior to participation in a practicum experience (FCHD 4950, 4970, 4980, or 5950).

Emphasis Requirements

After admission to the FCHD major, students must complete the requirements for one of the following four emphases: Family and Community Services, Human Development, Deaf Education, or Family Finance. These requirements are shown below.

Family and Community Services and Human Development Emphases

Majors choosing one of these two emphases prepare for employment in a variety of occupational settings. Previous graduates have found employment in such settings as child care, Head Start programs, social services agencies, drug treatment centers, youth and adult residential care centers, foster care, youth centers, crisis centers, parent education programs, senior citizen centers, long-term care facilities, adult day care centers, and a host of related federal, state, and local agencies serving families and children. Students are prepared to work in their communities to develop and guide policies for families and children. In addition, FCHD majors receive increased knowledge and skills in topics which will enhance their personal and family lives.

Core Courses (54 credits)

FCHD 1100 Critical Issues in Family, Consumer, and Human Development (F,Sp,Su)	1
FCHD 1500 (BSS) Human Development Across the Lifespan (F,Sp) ...	3
FCHD 2400 (BSS) Marriage and Family Relationships (F,Sp).....	3
FCHD 2610 Parenting and Child Guidance (F,Sp).....	3
FCHD 3100 Abuse and Neglect in Family Context (Prereq: Sophomore standing, FCHD 1500, 2400) (F,Sp)	3
FCHD 3110 Human Sexuality (Prereq: FCHD 1500, 2400) (F,Su).....	3
FCHD 3130 (QI) Research Methods (Prereq: STAT 1040) (majors only) (F,Sp).....	3
FCHD 3210 Families and Cultural Diversity (Prereq: FCHD 1500, 2400) (F,Sp) (majors only).....	3
FCHD 3510 Infancy and Early Childhood (Prereq: Junior standing, FCHD 1500, 2610) (F,Sp)	3
FCHD 3520 Children in the Middle Years (Prereq: Junior standing, FCHD 1500, 2610) (F,Sp)	3
FCHD 3530 Adolescence (Prereq: Junior standing, FCHD 1500) (F,Sp).....	3
FCHD 3540 Adult Development and Aging (Prereq: Junior standing and FCHD 1500, or instructor's permission) (F,Sp).....	3
FCHD 4220 Family Crises and Interventions (Prereq: Junior standing, FCHD 2400) (F,Sp).....	3
FCHD 4230 Families and Social Policy (Prereq: Junior standing, FCHD 2400) (F,Sp).....	3
FCHD 4240 Social and Family Gerontology (Prereq: Junior standing, FCHD 2400) (F,Sp).....	3
FCHD 4900 (CI) Pre-Practicum Skills (Prereq: Junior standing, FCHD 2610, 3100) (F,Sp).....	3
FCHD 4980¹ Practicum (F,Sp,Su)	6
PSY 2800 (QI) Psychological Statistics (Prereq: STAT 1040) (3 cr) or	
SOC 3120 (QI) Social Statistics I (Prereq: STAT 1040) (3 cr)	3

In addition to completing these core courses, all students must complete all courses listed below for either the Family and Community Services Emphasis or the Human Development Emphasis.

Family and Community Services Emphasis (7 credits)

FCHD 3500 Interdisciplinary Lab: Infancy or Middle Years (take concurrently with FCHD 3510 or 3520) (F,Sp)	1
FCHD 3350 (QI) Family Finance (F, Sp)	3
FCHD 5540 Family Life Education Methods (Prereq: Junior Standing, FCHD 1500, 2400) (F, Sp) (majors only).....	3

Human Development Emphasis (8 credits)

FCHD 3500 Interdisciplinary Lab: Infancy (Take concurrently with FCHD 3510) (F,Sp)	1
FCHD 3500 Interdisciplinary Lab: Middle Years (Take concurrently with FCHD 3520) (F,Sp)	1
FCHD 4550 Preschool Methods and Curriculum (Prereq: Junior standing, FCHD 1500) (F,Sp)	3
FCHD 4960² Practice Teaching in Child Development Laboratories (F,Sp,Su) (Prereq: Junior standing, FCHD 4550).....	3

Suggested Electives

FCHD 5550 Workshop: Casework Training I (F)	3
FCHD 5550 Workshop: Casework Training II (Sp).....	3

Deaf Education Emphasis

Majors choosing this emphasis are prepared to work with infants and young children who are hearing impaired and their families. Once students have completed their undergraduate degree, they can apply to the graduate program in the Department of Communicative Disorders and Deaf Education and work toward a master's degree with a specialization in Early Childhood Communicative Disorders. This master's program can be completed in two semesters plus a summer session. Students completing the master's program will have the skills necessary to work in early intervention programs called Parent-Infant Programs (or PIP). These programs may be found in every state of the country. Upon completion of the undergraduate FCHD major with the Deaf Education emphasis and the graduate Early Childhood Communicative Disorders specialization, students will have the coursework necessary to cover the competencies for the 0-3 Hearing Endorsement and the EI-2 credential which are necessary to be a parent advisor in Utah.

Required Courses³

FCHD 1100 Critical Issues in Family, Consumer, and Human Development (F,Sp,Su)	1
FCHD 1500 (BSS) Human Development Across the Lifespan (F,Sp) ...	3
FCHD 2400 (BSS) Marriage and Family Relationships (F,Sp).....	3
FCHD 2610 Parenting and Child Guidance (F,Sp).....	3
FCHD 3100 Abuse and Neglect in Family Context (Prereq: Sophomore standing, FCHD 1500, 2400) (F,Sp)	3
FCHD 3110 Human Sexuality (Prereq: FCHD 1500, 2400) (F,Su).....	3
FCHD 3130 (QI) Research Methods (Prereq: STAT 1040) (majors only) (F,Sp)	3
FCHD 3210 Families and Cultural Diversity (Prereq: FCHD 1500, 2400) (F,Sp) (majors only).....	3
FCHD 3500 Interdisciplinary Lab: Infancy (take concurrently with FCHD 3510) (F,Sp)	1
FCHD 3510 Infancy and Early Childhood (Prereq: Junior standing, FCHD 1500, 2610) (F,Sp).....	3
FCHD 3520 Children in the Middle Years (Prereq: Junior standing, FCHD 1500, 2610) (F,Sp).....	3
FCHD 4220 Family Crises and Interventions (Prereq: Junior standing, FCHD 2400) (F,Sp)	3
FCHD 4550 Preschool Methods and Curriculum (Prereq: Junior standing, FCHD 1500) (F,Sp)	3
FCHD 4900 (CI) Pre-Practicum Skills (Prereq: Junior standing, FCHD 2610, 3100) (F,Sp).....	3

Department of Family, Consumer, and Human Development

FCHD 4960² Practice Teaching in Child Development Laboratories (Prereq: Junior standing, FCHD 4550) (F,Sp,Su).....	3
FCHD 4980¹ Practicum (with ages 0-3) (F,Sp,Su)	3
COMD 2500 Language, Speech, and Hearing Development (F,Sp).....	3
COMD 2910 (CI) Sign Language I (F,Sp).....	4
COMD 3080 American Sign Language Practicum (F,Sp).....	1
PSY 2800 (QI) Psychological Statistics (Prereq: STAT 1040) (3 cr) or	
SOC 3120 (QI) Social Statistics I (Prereq: STAT 1040) (3 cr)	3
SPED 4000 Education of Exceptional Individuals (F,Sp,Su).....	2

In addition to these courses, students must complete the following courses during their senior year:

COMD 3080 American Sign Language Practicum (F,Sp).....	1
COMD 3910 Sign Language II (F,Sp,Su)	4
COMD 4630 Teaching Speech to Deaf and Hard of Hearing Children (Sp)	3
COMD 4750 Teaching the English Language to Individuals who are Deaf and Hard of Hearing (F).....	3
COMD 4770 Audiology and Teachers of Children who are Deaf and Hard of Hearing (F)	3
COMD 4780 Socio-Cultural Aspects of Deafness (F)	3
COMD 4790 Psychological Principles and Individuals who are Deaf and Hard of Hearing (Sp)	3
COMD 5610 Introduction to Education of the Deaf and Hard of Hearing (F)	3
SPED 5810 Seminar and Field Experiences with Infants and Families (Sp)	4

Students in this emphasis must meet with their advisor each semester.

¹Prerequisite: Junior standing, FCHD 4900, a total of at least 30 FCHD credits, and prior application approval by the Practicum Coordinator. Practicum application deadlines are February 15 for fall, June 15 for spring, and October 15 for summer.

²Students must sign up one year in advance in Family Life 205.

³For COMD and SPED course offerings, contact the Department of Communicative Disorders and Deaf Education and the Department of Special Education and Rehabilitation.

Family Finance Emphasis

Majors choosing this emphasis will be prepared for careers in financial counseling, advising, and education. Coursework focuses on the financial decisions that individuals and families face relating to insurance, investing, credit, budgeting, and home ownership. Students will complete an off-campus practicum and a Financial Counseling practicum at the Family Life Center on campus. At the Family Life Center, students will encounter various types of financial experiences, including new home buyer counseling sessions and workshops, as well as financial problems related to credit and budgeting, mortgage defaults, and reverse mortgages. The Family Life Center is a U.S. Department of Housing and Urban Development (HUD) approved housing and financial counseling agency that provides free counseling and education to the community. Employment opportunities exist with consumer credit counseling services, credit unions, the armed forces, corporate employee assistance programs, employee benefits counseling firms, college financial aid offices, bank loan offices, hospitals, corporate credit offices, bankruptcy courts, community housing programs, Federal Home Administration, and Housing and Urban Development. A student graduating with a Family Finance emphasis may be employed as a personal banker, mortgage loan officer, credit counselor, financial counselor or educator, consumer relations coordinator, military financial educator, debt collections coordinator, credit investigator, fraud detective, insurance broker, stockbroker, or financial planner.

Major Courses (59 credits)

FCHD 1100 Critical Issues in Family, Consumer, and Human Development (F,Sp,Su)	1
FCHD 1500 (BSS) Human Development Across the Lifespan (F, Sp).....	3
FCHD 2400 (BSS) Marriage and Family Relationships (F,Sp).....	3

FCHD 2450 (BSS) The Consumer and the Market (F,Sp)	3
FCHD 3130 (QI) Research Methods (Prereq: STAT 1040) (majors only) (F,Sp)	3
FCHD 3210 Families and Cultural Diversity (Prereq: FCHD 1500, 2400) (F,Sp) (majors only)	3
FCHD 3280 Economic Issues for Individuals and Families (Sp).....	3
FCHD 3310 Consumer Policy (Sp)	3
FCHD 3340 Housing: Societal and Environmental Issues (F)	3
FCHD 3350 (QI) Family Finance (F,Sp)	3
FCHD 3450 Consumer Credit Problems (Prereq: FCHD 3350) (F)	3
FCHD 4220 Family Crises and Interventions (Prereq: Junior standing, FCHD 2400) (F,Sp)	3
FCHD 4230 Families and Social Policy (Prereq: Junior standing, FCHD 2400) (F,Sp)	3
FCHD 4240 Social and Family Gerontology (Prereq: Junior standing, FCHD 2400) (F,Sp)	3
FCHD 4330 Family Finance Career Seminar (Prereq: FCHD 3350) (F).....	1
FCHD 4350 Advanced Family Finance (Prereq: FCHD 3350) (Sp)	3
FCHD 4460 Financial Counseling (Prereq: FCHD 3350, 3450) (majors only) (F,Sp)	3
FCHD 4950 Practicum: Consumer Science (majors only) (F,Sp,Su)	6
FCHD 5340 Housing Finance and Regulations (Prereq: FCHD 3340, 3350) (majors only) (Sp).....	3
FCHD 5950 Financial Counseling Practicum (Prereq: FCHD 4220, 4460, 5340) (majors only) (F,Sp,Su)	3

Required General Education Courses

ECON 1500 (BAI) Introduction to Economic Institutions, History, and Principles (F,Sp)	3
STAT 1040 (QL) Introduction to Statistics (Prereq: MATH 1010) (F,Sp,Su)	3
SPCH 1050 (CI) Public Speaking (F,Sp)	3

Suggested Support Courses

BA 3460 Fundamentals of Personal Investing	3
BIS 2450 Spreadsheets and Databases for Business	3
ECON 2010 (BSS) Introduction to Microeconomics	3
PFP 5060 Personal Financial Planning and Advising	3
PFP 5070 Retirement Planning	3
PFP 5080 Estate Planning	3

Prerequisites for FCHD 4950 and 5950 Family Finance Practica

FCHD 4950 and 5950 may be taken *only* by FCHD majors who have completed the application process. Prior to enrolling in FCHD 4950 or 5950, students must have completed a minimum of 70 semester credits. The following courses are also prerequisites for FCHD 4950 and 5950:

FCHD 1100 Critical Issues in Family, Consumer, and Human Development (F,Sp,Su)	1
FCHD 1500 (BSS) Human Development Across the Lifespan (F,Sp).....	3
FCHD 2400 (BSS) Marriage and Family Relationships (F,Sp).....	3
FCHD 2450 (BSS) The Consumer and the Market (F,Sp)	3
FCHD 3340 Housing: Societal and Environmental Issues (F)	3
FCHD 3350 (QI) Family Finance (F,Sp)	3
FCHD 3450 Consumer Credit Problems (Prereq: FCHD 3350) (F)	3
SPCH 1050 (CI) Public Speaking (F,Sp)	3

Additional Prerequisites for FCHD 5950, Financial Counseling Practicum

FCHD 4220 Family Crises and Interventions (Prereq: Junior standing, FCHD 2400) (F,Sp).....	3
FCHD 4460 Financial Counseling (Prereq: FCHD 3350, 3450) (majors only) (F,Sp)	3
FCHD 5340 Housing Finance and Regulations (Prereq: FCHD 3340, 3350) (majors only) (Sp).....	3

Department of Family, Consumer, and Human Development

Family and Human Development Minor

The minor in Family and Human Development (FHD) is designed to provide a knowledge base for understanding families and human development in order to enhance the training of majors in other academic disciplines. A 3.0 GPA is required for this minor. No more than 6 transfer credits may be used toward the FHD minor. Students applying for an FHD minor at USU, but transferring courses from other universities, must complete a minimum of three USU FCHD courses in order to earn an FHD minor. Courses counted toward the minor *may not* be taken *pass-fail*.

Required Courses (6 credits)

FCHD 1500 (BSS) Human Development Across the Lifespan (F,Sp)... 3
FCHD 2400 (BSS) Marriage and Family Relationships (F,Sp)..... 3

Elective Courses (9 credits)

Students must complete *three* of the following courses:

FCHD 2610 Parenting and Child Guidance (F,Sp)..... 3
FCHD 3100⁴ Abuse and Neglect in Family Context (F,Sp)..... 3
FCHD 3110⁵ Human Sexuality (F,Su)..... 3
FCHD 3510⁶ Infancy and Early Childhood (F,Sp)..... 3
FCHD 3520⁶ Children in the Middle Years (F,Sp)..... 3
FCHD 3530⁷ Adolescence (F,Sp)..... 3
FCHD 3540⁸ Adult Development and Aging (F,Sp)..... 3
FCHD 4220⁹ Family Crises and Interventions (F,Sp)..... 3
FCHD 4230⁹ Families and Social Policy (F,Sp)..... 3
FCHD 4240⁹ Social and Family Gerontology (F,Sp)..... 3

Students should be aware that the following courses *cannot* be used to fulfill requirements for the FHD minor: FCHD 2250, 2500, 3130, 4550, 4800, 4940, 5550; practica (FCHD 4900, 4950, 4960, 4970, 4980); and Readings and Conference (FCHD 4990).

⁴Prerequisites: Sophomore standing, FCHD 1500, 2400.

⁵Prerequisites: FCHD 1500, 2400.

⁶Prerequisites: Junior standing, FCHD 1500, 2610.

⁷Prerequisites: Junior standing, FCHD 1500.

⁸Prerequisites: Junior standing or instructor's permission, FCHD 1500.

⁹Prerequisites: Junior standing, FCHD 2400.

Family Finance Minor

Required Courses (6 credits)

FCHD 2450 (BSS) The Consumer and the Market (F,Sp) 3
FCHD 3350 (QI) Family Finance (F,Sp) 3

Elective Courses (9 credits)

Students must complete *at least 9 credits* in courses selected from the following:

FCHD 3280 Economic Issues for Individuals and Families (Sp)..... 3
FCHD 3310 Consumer Policy (Sp) 3
FCHD 3340 Housing: Societal and Environmental Issues (F) 3
FCHD 3450 Consumer Credit Problems (Prereq: FCHD 3350) (F) 3
FCHD 4350 Advanced Family Finance (Prereq: FCHD 3350) (Sp) 3

Early Childhood Education Major

Majors in early childhood education are licensed to teach in preschool, kindergarten, and grades 1-3. Several practica and field experiences with children are provided, and a subject matter emphasis is selected. This major is a cooperative effort between the Department of Family, Consumer, and Human Development and the Department of Elementary Education. Students are required to complete a student teaching practicum in a preschool program, a kindergarten, and in the public schools grades 1, 2, or 3. Additional materials describing the ECE major in the Department of Family, Consumer, and Human Development are available from the advisors in FL 205.

University Studies Requirements

Early Childhood Education Majors are required to take certain classes

to fulfill the University Studies requirements. The following sections list the specific courses to choose from:

Quantitative Literacy (QL) (3 credits)

(A grade lower than a C- will not be accepted in this course.)

STAT 1040 (QL) Introduction to Statistics 3
(MATH 1050 or Math ACT score of 25 or higher is required to apply to the Teacher Education Program.)

Breadth Requirements (21 credits)

Choose *one* course from the following to meet BAI requirement:

ECON 1500, HIST 1700, POLS 1100, USU 1300 3

Choose *one* course from the following to meet BCA requirement:

MUSC 1010, USU 1330, ID 1750 3

Choose *one* course from the following to meet BHU requirement:

ANTH 1710, HIST 1030, HIST 1050, PHIL 1010, PHIL 1200, PHIL 2400, PHIL 2500, USU 1320 3

Choose *one* course from the following to meet BSS requirement:

ANTH 1010, ANTH 2100, ASTE 2900, ENVIS 2340, GEOG 1030, GEOG 2030, JCOM 1000, NR 1010, POLS 2200, SOC 1010, USU 1340 3

Choose *one* course from the following to meet BLS requirement:

AWER 1200, BIOL 1010, FRWS 2200, NFS 1020, PLSC 2100, USU 1350 3

Choose *two* courses from the following to meet BPS requirement:

BMET 2000, GEOG 1130, GEOL 1100, GEOL 1150, CHEM 1010, PHYX 1000, PHYX 1200, SOIL 2000, USU 1360 6

Depth Education Requirements

Communications Intensive (CI) (2 courses)

ELED 3000 (CI) Foundation Studies and Practicum in Teaching and Classroom Management Level II 6

ELED 4030 (CI) Teaching Language Arts and Practicum Level III 3
(ELED 3000 and 4030 are included in major requirements.)

Quantitative Intensive (QI) (1 course)

(A grade lower than a C- will not be accepted in this course.)

MATH 2020 (QI) Introduction to Logic and Geometry 3
(Prereq: MATH 1050 or Math ACT score of 25 or higher; also required to apply to the Teacher Education Program)

Depth Course Requirements (2 courses)

Choose two approved University Studies depth courses designated DSC, DHA, or DSS (outside of area of emphasis).

Early Childhood Education Major (80 credits) (minimum 2.75 GPA)

Offered in Conjunction with Elementary Education Department.

Note: Grades lower than a C will not be accepted in the major.

Admission criteria for the **Teacher Education Program** include: completion of 30 credits with a cumulative GPA of 2.75, successful performance on the ACT exam, successfully passing the Teacher Education Writing Exam, a speech and hearing test, and high potential as a teacher as judged by performance in a small-group interview. Admission is limited to ensure a quality program and by the availability of space. **Note:** Please contact an advisor if PPST (Pre-Professional Skills Test) results are being used in the admission process.

Students majoring in Early Childhood Education must complete all of the following courses as indicated.

Department of Family, Consumer, and Human Development

FCHD Required Course (1 credit)

FCHD 1100 Critical Issues in Family, Consumer, and Human Development (F,Sp,Su)	1
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Level I¹⁰ (6 credits)

ELED 1000 Orientation to Elementary Education	3
FCHD 1500 (BSS) Human Development Across the Lifespan	3

Level II (12 credits)

Students must be officially admitted to the Teacher Education Program prior to Level II.

ELED 3000 (CI) Foundation Studies and Practicum in Teaching and Classroom Management Level II	6
FCHD 2250 Seminar and Practicum in Early Childhood Education	4
PSY 3660 Educational Psychology for Teachers	2

(Level II courses must be taken concurrently.)

Transition (14 credits)

SPED 4000 Education of Exceptional Individuals	2
ELED 3100 ¹¹ Teaching Reading I	3
INST 4010 ¹² Principles and Practices of Technology for Elementary Teachers	3
FCHD 4550 ¹³ Preschool Methods and Curriculum	3
ELED 4480 ¹¹ Early Childhood Education Kindergarten through Grade 3	3

Level III (15 credits; must follow Level II)

ELED 4000 Teaching Science and Practicum Level III	3
ELED 4030 (CI) Teaching Language Arts and Practicum Level III	3
ELED 4040 (CI) Teaching Reading II and Practicum Level III	3
ELED 4050 Teaching Social Studies and Practicum Level III	3
ELED 4060 Teaching Mathematics and Practicum Level III	3

(Level III courses must be taken concurrently.)

Level IV (21 credits)

ELED 5050 Student Teaching—Kindergarten	6
ELED 5100 Student Teaching—Primary Grades (1-3)	6
ELED 5250 Student Teaching—Seminar	3
FCHD 4960 ^{13,14} Practice Teaching in Child Development Laboratories	6

(Level IV courses must be taken during two semesters.)

Emphasis (12 credits)

Descriptions of available emphasis areas are shown below.

Electives (if needed to complete 120 credits)

Choose Breadth Electives from the following courses:

ART 3700 Elementary Art Methods	3
THEA 4030 Storytelling	3
THEA 4330 Drama and Theatre for Youth: Grades K-6	3
THEA 5360 Drama in the Secondary Education Classroom: Grades 7-12	3
HEP 3500 Elementary School Health Education	2
PEP 3050 Physical Education in the Elementary School	3
PEP 3650 Movement Exploration for Elementary Teachers	2
ETE 3070 K-8 Engineering and Technology Education	3
ENVS 5110 Environmental Education	3
ELED 4410 Gifted Education in the Regular Classroom	3
ELED 4420 Multiple Talent Approach to Thinking	2
FCHD 2610 Parenting and Child Guidance	3
ENGL 3530 ¹⁵ Children's Literature	3
MUSC 3260 Elementary School Music	2

¹⁰These courses are prerequisites to Level II.

¹¹This course must be taken following Level II and prior to Level III.

¹²Students must complete Level II before taking this course.

¹³FCHD 4550 is a prerequisite for FCHD 4960.

¹⁴Students must sign up for FCHD 4960 at least three full semesters in advance of taking the class. Apply in Family Life Building, room 214.

¹⁵ENGL 3530 is highly recommended.

Early Childhood Areas of Emphasis

Students majoring in Early Childhood Education are required to complete 12 credits in an area of emphasis. The area of emphasis must be chosen from the following fields: Language Arts, Social Studies, Mathematics/General Science, General Science, Fine Arts, Art, Music, Physical Education, Health/Wellness/ Nutrition, Foreign Language, School Library Media, or English as a Second Language. **Students must choose two upper-division courses numbered 3000 or above.**

Requirements for the areas of emphasis are listed below and on the following pages. Grades lower than C- will not be accepted in the areas of emphasis.

Language Arts Emphasis (12 credits)

Select two courses from each group. Remaining courses (if any) may be selected from any of the courses listed.

Listening and Speaking

SPCH 1050 (CI) Public Speaking	3
SPCH 2600 (CI) Interpersonal Communication	3
SPCH 3330 (DSS) Intercultural Communication	3
THEA 1030 (BHU) Exploring Performance Through Aesthetic Texts	3
THEA 4030 Storytelling	3
THEA 4330 Drama and Theatre for Youth: Grades K-6	3
THEA 5360 Drama in the Secondary Education Classroom: Grades 7-12	3

Reading and Writing

ENGL 1030 (BHU) Understanding Literature	3
ENGL 1120 Elements of Grammar	3
ENGL 1710 (BHU) Introduction to Folklore	3
ENGL 2720 Survey of American Folklore	3
ENGL 3030 (DHA) Perspectives in Literature	3
ENGL 3040 (DHA) Perspectives in Writing and Rhetoric	3
ENGL 3420 Fiction Writing	3
ENGL 3530 Children's Literature	3
ENGL 3700 (CI) Regional Folklore	3

Electives

ENGL 2100 Introduction to Literary Theory	3
ENGL 2140 British Literary History: Anglo-Saxon to 18th Century	3
ENGL 3050 (DHA) Masterpieces of World Literature	3
ENGL 3070 (DHA) Perspectives in Folklore	3
ENGL 3430 Poetry Writing	3
ENGL 3510 Young Adult Literature	3
ENGL 3520 Multicultural American Literature	3
ENGL 4300 Shakespeare	3
COMD 2500 Language, Speech, and Hearing Development	3

Social Studies Emphasis (12 credits)

The purpose of this area is to offer students the opportunity to broaden their understanding of social studies. Students should select courses from at least three areas to constitute the 12 credits required.

Anthropology

ANTH 1010 (BSS) Cultural Anthropology	3
ANTH 1030 (CI/BSS) World Archaeology	3
ANTH 2100 (BSS) Peoples of the Contemporary World	3
ANTH 3130 (CI) Peoples of Latin America	3
ANTH 3160 (DSS) Anthropology of Religion	3
ANTH 3200 (CI/DSS) Perspectives on Race	3
ANTH 4110 (DSS) Southwest Indian Cultures, Past and Present	3

Economics

ECON 1500 (BAI) Introduction to Economic Institutions, History, and Principles	3
ECON 2010 (BSS) Introduction to Microeconomics	3

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Political Science

POLS 1100 (BAI) United States Government and Politics	3
POLS 2100 Introduction to International Politics.....	3
POLS 2200 (BSS) Comparative Politics	3
POLS 3120 (DSS) Law and Politics	3
POLS 3140 (DSS) The Presidency	3
POLS 3190 (DSS) Gender, Power, and Politics.....	3
POLS 3310 (DSS) American Political Thought	3

Sociology

SOC 1010 (BSS) Introductory Sociology	3
SOC 1020 Social Problems.....	3
SOC 3010 Race, Class, and Gender	3
SOC 3110 (CI) Methods of Social Research.....	3
SOC 3120 (QI) Social Statistics I	3
SOC 3200 (DSS) Population and Society	3
SOC 3410 Juvenile Delinquency.....	3
SOC 3500 Social Psychology	3
SOC 3610 (DSS) Rural Sociology.....	3
SOC 3750 Sociology of Aging	3
SOC 4010 Contemporary Sociological Theory.....	3

Geography

GEOG 1030 (BSS) World Regional Geography.....	3
GEOG 2030 (BSS) Human Geography	3
GEOG 3850 Map, Air Photo, and GIS Interpretation.....	4
GEOG 4200 (CI) Regional Geography.....	3

History

HIST 1020 (BHU) Cultural and Economic Exchange in the Pre-Nineteenth Century World	3
HIST 1030 (BHU) The Modern World	3
HIST 1040 (BHU) Foundations of Western Civilization: Ancient and Medieval	3
HIST 1050 (BHU) Foundations of Western Civilization: Modern.....	3
HIST 1060 (BHU) Introduction to Islamic Civilization.....	3
HIST 1600 American Cultures in Film	3
HIST 1710 (BHU) Introduction to Folklore	3
HIST 2700 (BAI) United States to 1877	3
HIST 2710 (BAI) United States 1877 to Present.....	3
HIST 2720 Survey of American Folklore	3
HIST 3240 Modern Europe from 1789 to the Present.....	3
HIST 3330 The Soviet Union and its Heirs	3
HIST 3510 Africa and the World	3
HIST 3620 History of Colonial Latin America	3
HIST 3700 (CI) Regional Folklore	3
HIST 3720 Colonial America	3
HIST 3750 Civil War and Reconstruction	3
HIST 3770 Contemporary America, 1945-Present.....	3
HIST 3840 Twentieth Century American West	3
HIST 3850 (CI/DHA) History of Utah.....	3
HIST 4230 (CI/DHA) The History of Christianity in the West	3
HIST 4330 Modern Germany with Special Emphasis on the Twentieth Century.....	3
HIST 4390 British Imperialism from 1688 to the Present	3
HIST 4550 (CI/DHA) The History of Women and Family in America	3
HIST 4600 (CI/DHA) The History of the American West.....	3
HIST 4640 (CI) Studies in the American West	3
HIST 4710 American Indian History	3
HIST 4730 (CI) History of Black America	3

Additional Courses

NR 1010 (BSS) Humans and the Changing Global Environment.....	3
ENVS 5110 Environmental Education.....	3
PHIL 1010 (BHU) Introduction to Philosophy.....	3
PHIL 2400 (BHU) Ethics	3

SW 1050 Introduction to Social Welfare.....	3
SW 3350 Child Welfare	3

Mathematics/General Science Emphasis (12 credits)

Choose one course from each category: Mathematics, Physical Science, and Biological (Life) Science. Remaining credits may be chosen from any category.

Mathematics

MATH 1060 Trigonometry	2
MATH 1100 (QL) Calculus Techniques	3
MATH 3110 Modern Geometry.....	3

Physical Science

CHEM 1110 (BPS) General Chemistry I	4
CHEM 1120 (BPS) General Chemistry II	4
PHYX 1000 (BPS) Introductory Astronomy.....	3
PHYX 1020 (BPS) Energy	3
PHYX 1030 (BPS) Intelligent Life in the Universe.....	3
PHYX 3010 (DSC/QI) Space Exploration from Earth to the Solar System	3
PHYX 3020 (DSC) Great Scientists	3
PHYX 3030 (DSC/QI) The Universe.....	3
BMET 2000 (BPS) The Atmosphere and Weather.....	3
BMET 3820 (DSC/QI) Climate Change.....	3
SOIL 3000 Fundamentals of Soil Science.....	4
GEOG 1150 (BPS) The Dynamic Earth: Physical Geology	4
GEOG 3200 (DSC) The Earth Through Time	4
GEOG 1130 (BPS) Physical Geography.....	3

Biological (Life) Science

AWER 3000 (DSC) Oceanography	3
BIOL 1110 Elementary Microbiology	4
BIOL 1210 Biology I	4
BIOL 1220 (BLS) Biology II.....	4
BIOL 2000 Human Physiology	4
BIOL 2010 Human Anatomy	4
BIOL 3010 (CI/DSC) Evolution.....	3
BIOL 3030 (DSC) Genetics and Society.....	3
BIOL 3200 (QI) Principles of Genetics	4
BIOL 3300 General Microbiology	4
ENVS 5110 Environmental Education.....	3
FRWS 2200 (BLS) Ecology of Our Changing World.....	3
NR 1010 (BSS) Humans and the Changing Global Environment.....	3
NR/BIOL 2220 General Ecology	3
PUBH 3120 Family and Community Health	3
PUBH/CEE 3610 Environmental Management.....	3
NFS 1020 (BLS) Science and Application of Human Nutrition	3
HEP 3000 Drugs and Human Behavior.....	3

General Science Emphasis (12 credits)

Choose science courses from the preceding lists. One course must be from the Physical Science category and one must be from the Biological (Life) Science category. Remaining credits may be chosen from either category.

Fine Arts Emphasis (12 credits)

Early Childhood Education Majors should choose MUSC 3260 as a general elective.

Required:

ART 1110 Drawing I (3 cr) or	
ART 3700 Elementary Art Methods (3 cr)	3
MUSC 1010 (BCA) Introduction to Music (3 cr) or	
MUSC 3010 (DHA) Masterpieces of Music (3 cr)	3
THEA 4330 Drama and Theatre for Youth: Grades K-6.....	3

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Choose remaining credits from the following:

ART 2140 Drawing II	3
ART 2810 Photography I.....	3
PEP 2500 Rhythms and Movement	1
THEA 1030 (BHU) Exploring Performance Through Aesthetic Texts.....	3

Art Emphasis (12 credits)

Early Childhood Education majors should consult with their advisor before choosing this emphasis.

ART 1100 (BCA) Exploring Art (3 cr) or	
ART 2710 (BHU) Survey of Western Art: Prehistoric to Medieval (3 cr) or	
ART 2720 (BHU) Survey of Western Art: Renaissance to Post-Modern (3 cr)	3
ART 1110 Drawing I (3 cr) or	
ART 1120 Two-dimensional Design (3 cr).....	3
ART 2650 Introduction to Ceramics	3
ART 3700 Elementary Art Methods.....	3

Music Emphasis (12 credits)

Required:

MUSC 1010 (BCA) Introduction to Music	3
MUSC 1110 Music Theory I.....	3
MUSC 1600 Voice Techniques	1
MUSC 3260 Elementary School Music	2

Choose remaining 3 credits from the following:

Appropriate piano course(s) (3 cr) or	
Guitar course(s) (3 cr) or	
Acceptable substitute courses, approved by advisor (3 cr).....	3

Physical Education Emphasis (12 credits)

Required:

PE 3000 Dynamic Fitness	3
PEP 3200 (CI) Motor Learning and Skill Analysis	3
HEP 2000 First Aid and Emergency Care	2

Choose remaining credits from the following:

PEP 2200 Skills 2 (Lifetime Activities).....	1
PEP 2300 Skills 3 (Softball, Basketball, Soccer).....	1
PEP 2400 Skills 4 (Tennis, Badminton, Track and Field)	1
PEP 2500 Rhythms and Movement	1
PRP 1500 Social Recreation Leadership	3

Health/Wellness/Nutrition Emphasis (12 credits)

Choose one of the following two courses:

NFS 1020 (BLS) Science and Application of Human Nutrition	3
NFS 2020 Nutrition Throughout the Life Cycle.....	3

Choose remaining credits from the following:

NFS 1000 World of Food and Nutrition	1
NFS 3110 (DSC) Food, Technology, and Health	3
BIOL 2000 Human Physiology	4
HEP 2000 First Aid and Emergency Care	2
HEP 2500 Health and Wellness	2
HEP 3000 Drugs and Human Behavior.....	3
HEP 3500 Elementary School Health Education.....	2
PUBH 3120 Family and Community Health	3
PE 3000 Dynamic Fitness	3

Foreign Language Emphasis (12 credits)

A foreign language area of emphasis may be designed by a student, provided it is limited to one language.

School Library Media Certification

This certification will fulfill the emphasis requirement for Early

Childhood Education majors. For a list of required courses, contact the Instructional Technology Department.

English as a Second Language (ESL) Endorsement

This endorsement will fulfill the emphasis requirement for Early Childhood Education majors. For a list of required courses, students should contact their advisor. (Completing 12 credits toward the ESL Endorsement will fulfill an ESL Emphasis.)

Optional Supporting Area in Parenting for Early Childhood Education Majors (17 credits)

The Early Childhood Education requirements can be met and then additional credits taken to complete a supporting area in parenting. This may enhance employment opportunities in school districts, day care, and preschools where there is a strong commitment to a parent involvement program, or as an instructor for community adult education programs.

FCHD 3510 ¹⁶ Infancy and Early Childhood (Coreq: FCHD 3500, Interdisciplinary Lab: Infancy).....	3
FCHD 3500 ¹⁶ Interdisciplinary Lab: Infancy (Coreq: FCHD 3510)	1
FCHD 3520 ¹⁶ Children in the Middle Years (Coreq: FCHD 3500, Interdisciplinary Lab: Middle Years).....	3
FCHD 3500 ¹⁶ Interdisciplinary Lab: Middle Years (Coreq: FCHD 3520)	1
FCHD 3110 ¹⁷ Human Sexuality	3
NFS 1020 (BLS) Science and Application of Human Nutrition	3

¹⁶Prerequisites: Junior standing and FCHD 1500, 2610.

¹⁷Prerequisites: FCHD 1500, 2400.

Family and Consumer Sciences Major

The Family and Consumer Sciences (FCS) major is an integrative major that links the various fields within the family and consumer sciences profession and prepares the student for positions requiring interdisciplinary problem-solving skills. The Family and Consumer Sciences major prepares graduates for positions in business, local/state/federal agencies, child care centers, youth programs, job training centers, and other related agencies.

Admission Requirements

To qualify for admission to the Family and Consumer Sciences (FCS) major, students must complete *at least* 24 semester credits (including FCHD 1100, 1500, 2400, and 2450) with a cumulative GPA of at least 3.0. However, students who have completed *less than 24 credits* may declare a premajor in FCS.

Departmental Program Requirements

The department has several regulations governing students' academic progress:

1. The *P/D+*, *D*, *F* option cannot be used for courses required in the FCS major
2. An overall cumulative GPA of 2.75 is required for entrance to the major. An overall GPA of 2.75 is required for graduation.
3. **Ten-year Policy.** Courses which are required for the major will be accepted *only* if they have been completed within the last 10 years.

FCHD 1100 Critical Issues in Family, Consumer, and Human Development (F,Sp,Su)	1
FCHD 1500 (BSS) Human Development Across the Lifespan (F,Sp).....	3
FCHD 2400 (BSS) Marriage and Family Relationships (F,Sp).....	3
FCHD 2450 (BSS) The Consumer and the Market (F,Sp)	3

Department of Family, Consumer, and Human Development

Major Courses (51 credits)

Students must select courses from each of the following five areas. The minimum number of credits to be selected from each area is shown in parentheses.

Human Development and Family Studies (12 credits)

Select at least 12 credits from the following:

FCHD 2610 Parenting and Child Guidance (F,Sp)	3
FCHD 3100 Abuse and Neglect in Family Context (Prereq: Sophomore standing, FCHD 1500, 2400) (F,Sp)	3
FCHD 3110 Human Sexuality (Prereq: FCHD 1500, 2400) (F,Su)	3
FCHD 3500 Interdisciplinary Lab: Infancy (F,Sp)	1
FCHD 3500 Interdisciplinary Lab: Children in the Middle Years (F,Sp)	1
FCHD 3510 Infancy and Early Childhood (Prereq: Junior standing, FCHD 1500, 2610) (F,Sp)	3
FCHD 3520 Children in the Middle Years (Prereq: Junior standing, FCHD 1500, 2610) (F,Sp)	3
FCHD 3530 Adolescence (Prereq: Junior standing, FCHD 1500) (F,Sp)	3
FCHD 3540 Adult Development and Aging (Prereq: Junior standing and FCHD 1500, or instructor's permission) (F,Sp)	3
FCHD 4220 Family Crises and Interventions (Prereq: Junior standing, FCHD 2400) (F,Sp)	3
FCHD 4230 Families and Social Policy (Prereq: Junior standing, FCHD 2400) (F,Sp)	3
FCHD 4240 Social and Family Gerontology (Prereq: Junior standing, FCHD 2400) (F,Sp)	3
FCHD 4550 Preschool Methods and Curriculum (Prereq: Junior standing, FCHD 1500) (F,Sp)	3

Consumer and Family Finance (12 credits)

Select at least 12 credits from the following:

FCHD 3280 Economic Issues for Individuals and Families (Sp)	3
FCHD 3310 Consumer Policy (Sp)	3
FCHD 3340 Housing: Societal and Environmental Issues (F)	3
FCHD 3350 (DSS/QI) Family Finance (Prereq: MATH 1030 or MATH 1050 or STAT 1040) (F,Sp)	3
FCHD 3450 Consumer Credit Problems (Prereq: FCHD 3350) (F)	3
FCHD 4330 Family Finance Career Seminar (Prereq: FCHD 3350) (F)	1
FCHD 4350 Advanced Family Finance (Prereq: FCHD 3350) (Sp)	3
FCHD 5340 Housing Finance and Regulations (Prereq: FCHD 3340, 3350) (majors only) (Sp)	3

Foods and Nutrition (9 credits)

Select at least 9 credits from the following:

NFS 1000 World of Food and Nutrition (F)	1
NFS 1020 (BLS) Science and Application of Human Nutrition (F,Sp,Su)	3
NFS 1240 Culinary Basics (F,Su)	3
NFS 1250 Sanitation and Safety (Sp)	3
NFS 2020 Nutrition Throughout the Life Cycle (Prereq: NFS 1020) (Sp)	3
NFS 2030 Catering (Prereq: NFS 1240, 1250) (F)	3
NFS 3020 Nutrition and Physical Performance (Prereq: NFS 1020) (F)	2
NFS 3110 (DSC) Food, Technology, and Health (Prereq: University Studies Breadth Life Sciences Course) (F)	3
NFS 4070 Experimental Foods (Prereq: CHEM 1120 or 2300 or 2310) (Sp)	4
NFS 4480 Community Nutrition (Prereq: NFS 1020) (F)	3

Research Methods and Professional Courses (12 credits)

The following courses are required:

FCHD 3130 (QI) Research Methods (Prereq: STAT 1040) (F,Sp) (majors only)	3
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FCHD 3210 Families and Cultural Diversity (Prereq: FCHD 1500, 2400) (F,Sp) (majors only)	3
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Choose one of the following:

BIS 1550 (CI) Business Correspondence (taught through Center for Independent and Distance Learning <i>only</i>)	3
BIS 2550 (CI) Business Communication (F,Sp,Su)	3
FCHD 4900 (CI) Pre-Practicum Skills (Prereq: Junior Standing, FCHD 2610, 3100) (F,Sp)	3
SPCH 1050 (CI) Public Speaking (F,Sp)	3
SPCH 2600 (CI) Interpersonal Communication (F,Sp)	3

Choose one of the following:

FCHD 4900 (CI) Pre-Practicum Skills (Prereq: Junior Standing, FCHD 2610, 3100) (F,Sp)	3
PHIL 2400 (BHU) Ethics (Sp)	3
PHIL 2500 (BHU) Social Ethics (F)	3

Practicum (6 credits)

Complete a total of 6 credits from one or both of the following:

FCHD 4950¹⁸ Practicum: Consumer Science (F,Sp,Su)	3-6
FCHD 4960¹⁹ Practice Teaching in Child Development Laboratories (Prereq: Junior Standing, FCHD 4550) (F,Sp,Su)	3

Suggested Support Courses

The following courses are *suggested* (but not required) for students in the FCS major:

FCSE 2040 Clothing Production Principles (F,Sp)	3
FCSE 3030 (DSC) Textile Science (Sp)	4
FCSE 3040 Advanced Clothing Production Principles (F,Sp)	3
FCSE 3060 (DSS/CI) Human Behavior Related to Dress (F)	3
ID 1790 (BCA) Interior Design Theory (Sp)	3
ID 3740 (DHA) History of Interior Furnishings and Architecture I (F)	3
ID 3750 (DHA/CI) History of Interior Furnishings and Architecture II (Sp)	3

¹⁸Enrollment in FCHD 4950 is limited to FCS majors *only*, who have received prior approval from the Practicum Coordinator. Prior to enrollment, students must have achieved junior standing, and must have completed a total of at least 30 FCHD credits, a Communications Intensive (CI) course, and an ethics course. Practicum application deadlines are as follows: February 15 for fall semester, June 15 for spring semester, and October 15 for summer semester.

¹⁹Students must sign up one year in advance in Family Life 205.

Departmental Honors

Students who would like to experience greater academic depth within their major are encouraged to enroll in departmental honors. Through original, independent work, Honors students enjoy the benefits of close supervision and mentoring, as they work one-on-one with faculty in select upper-division departmental courses. Honors students also complete a senior project, which provides another opportunity to collaborate with faculty on a problem that is significant, both personally and in the student's discipline. Participating in departmental honors enhances students' chances for obtaining fellowships and admission to graduate school. Minimum GPA requirements for participation in departmental honors vary by department, but usually fall within the range of 3.30-3.50. Students may enter the Honors Program at almost any stage in their academic career, including at the junior (and sometimes senior) level. The campus-wide Honors Program, which is open to all qualified students regardless of major, offers a rich array of cultural and social activities, special classes, and the benefit of Honors early registration. Interested students should contact the Honors Program, Merrill Library 374, (435) 797-2715, honors@cc.usu.edu. Additional information can be found online at:

<http://www.usu.edu/honors/>

Department of Family, Consumer, and Human Development

Additional Information

For more detailed information about the Family, Consumer, and Human Development; Early Childhood Education; and Family and Consumer Sciences majors, see the current major requirement sheets or an advisor in the FCHD Advising Center (Family Life 205). Major requirement sheets are also available online at: <http://www.usu.edu/ats/majorsheets/>

Financial Support

In addition to the scholarships, assistantships, grants-in-aid, and work-study programs available through the University, the College of Education and Human Services and the Department of Family, Consumer, and Human Development also give scholarships and other types of support each year. Students should inquire at the Dean's Office in Education 109, the departmental advising office in Family Life 205, or the Financial Aid Office in Student Center 106.

Graduate Programs

Admission Requirements

See general admission requirements on pages 93-94. Students may use either the GRE or MAT for application for all specializations in the MS degree, but the GRE is required for the PhD program. Additional assessment is required for admission to the MS marriage and family therapy specialization. An applicant's MAT score, or the GRE verbal and quantitative scores, should be at or above the 40th percentile. Applications are expected to be completed by January 15, but may be considered throughout the year, with the *exception* of applications for the Marriage and Family Therapy (MFT) Specialization. MFT applications *must* be received by January 15.

Degree Programs

Graduate students receive a strong research and theoretical base in family relationships, consumer sciences, and human development. In addition to the core courses required for each of the specializations, students have the opportunity to achieve their program goals with a wide range of other graduate courses in the department, as well as designated courses in related programs at USU. Graduate students also engage in independent study, practica, and other specialized professional experiences that help them to acquire specific skills.

The department provides advanced graduate education and training for students to (1) establish the professional competency necessary for employment in research, teaching, marriage and family therapy, extension, and administration; (2) develop skills necessary for agency administration in the field of family and child care services; (3) receive clinical training in marriage and family therapy; (4) develop the skills for supervisory responsibilities in child development laboratories, child-care facilities, and adolescent programs; and (5) develop the skills and expertise to work in financial and consumer services agencies and organizations.

MS in Family, Consumer, and Human Development

Students in the MS program complete a research thesis that makes a contribution to knowledge in family studies, human development, or consumer sciences.

All students in the MS Marriage and Family Therapy specialization also complete required clinical experiences. The MS Marriage and Family Therapy specialization satisfies basic educational requirements for Utah State licensure in marriage and family therapy and clinical membership in AAMFT. The Marriage and Family Therapy specialization is accredited by the Commission on Accreditation for Marriage and Family Therapy Education.

Master of Family and Human Development (MFHD)

The MFHD is a practice-oriented, but nonclinical, master's degree especially suitable for individuals already working or planning to work in the family or social service sectors, education, corrections, or related fields. The MFHD does not require a thesis. A new group of students is enrolled every two years in the distance-delivered program.

PhD in Family, Consumer, and Human Development

Students in the PhD program complete a major research dissertation that makes a significant contribution to the theoretical and empirical knowledge in family studies, consumer sciences, or human development.

Background Check

Students are required to pass a background check prior to participation in a practicum experience (FCHD 6980 or 7980).

Specializations

The MS degree has specializations in Adolescence and Youth, Adult Development and Aging, Consumer Sciences, Infancy and Childhood, Marriage and Family Relationships, and Marriage and Family Therapy. Further information may be obtained from the department and by accessing the department's home page at: <http://www.usu.edu/fchd>

Course Requirements

The core substantive courses for the master's degree are FCHD 6030, 6050, 6060, and 6070. Master's students also complete course requirements under their chosen specialization in Marriage and Family Relationships, Marriage and Family Therapy, Consumer Sciences, Infancy and Childhood, Adolescence and Youth, or Adult Development and Aging. Elective courses and thesis topics are individualized with each student by faculty supervisory committees.

Doctoral core courses are FCHD 7060 and 7070. Doctoral students also complete topical seminars, methods and statistics courses, research and teaching internships, comprehensive exams, and dissertation research. For more specific information, see the department's *Graduate Student Handbook* online at: http://www.usu.edu/fchd/graduate_handbook.pdf

Research

The department has three major child development laboratories, other research labs, marriage and family therapy facilities, and housing and financial counseling facilities that are available for research and training in the graduate program. The department enjoys a long history of research activities with preschools, public schools, extension programs, financial institutions, and other agencies throughout the state, and has a program of gerontology research.

Department of Family, Consumer, and Human Development

Recent faculty and graduate student research projects have been funded by the state Office of Child Care and the Office of Juvenile Justice, and by the national Office of Head Start, the Office of Adolescent Pregnancy Programs, Child Trends Inc., the National Institute of Child Health and Human Development, the National Institute of Health, the U.S. Department of Agriculture, the U.S. Department of Justice, the National Institutes on Aging, and the Kellogg Foundation, among others.

Financial Assistance

Extensive teaching, research, and extension graduate assistantships are available for applicants for both the MS and PhD degrees. Attractive fellowships are available for strong PhD students with high GPA and high GRE scores. When an applicant's folder is complete, it is reviewed by the Graduate Admissions and Finance Committee, which makes specific recommendations regarding admission and financial support. Assistantships and fellowships include waivers for out-of-state tuition. Doctoral students can also receive waivers for in-state tuition with a half-time teaching or research assistantship.

Career Opportunities

Recent recipients of advanced degrees have found employment in public schools, academic departments at colleges and universities, research centers, hospitals, Head Start, child care programs, social services agencies, mental health agencies, private and clinical practice settings, extension services, financial institutions and agencies, and related agencies that teach about, study, or serve individuals, families, and consumers.

Additional Information and Updates

The department publishes a *Graduate Student Handbook* providing more details about graduate program admission and requirements. This handbook is available online at: <http://www.usu.edu/fchd>

Family, Consumer, and Human Development Faculty

Professors

Ann M. Berghout Austin, alternative child care and family life, development from birth to 12 years of age
Thomas R. Lee, parenting, family life education, family resiliency, at-risk youth, marriage education
Shelley L. Knudsen Lindauer, alternative child care, early childhood education and curriculum, child care administration, socialization, development in infancy and early childhood
Jean M. Lown, consumer and family economics
Brent C. Miller, marriage and family relationships, adolescent pregnancy, adoption, research methods
Lori A. Roggman, infant social development, attachment, parenting stress, play across the life span, physical attractiveness, early intervention
Barbara R. Rowe, family resource management, extension

Adjunct Professors

Frank R. Ascione, prosocial development, moral development, developmental psychopathology
Sarah Rule, methods of early intervention, applications of technology to staff development, improvement of service delivery systems

Professors Emeritus

Glen O. Jensen, marriage education, in-law and grandparent role performance, family life education, work/family challenges
Jay D. Schvaneveldt, marriage and family studies, family life education, international families, theory and methods

Associate Professors

Scot M. Allgood, family therapy process, assessment, and marital studies
Randall M. Jones, adolescent development, identity, problem behavior, prevention, research methods
Thorana S. Nelson, marriage and family therapy, gender, family therapy training and supervision
D. Kim Openshaw, marriage and family therapy, research and application, typological and intervention strategy advancement of youthful sexual offending, theoretical conceptualization of self-esteem, martial arts and mental health related syndromes
Kathleen W. Piercy, midlife, older adults and family caregiving, family policy, qualitative methodology

Assistant Professors

Troy E. Beckert, life span, human development, adolescence, research methods, parenting
Karen Biers, clothing and textiles, home-based entrepreneurship, extension
Lucy Delgado, family and consumer sciences, housing
Yoon G. Lee, family and consumer sciences, family finance
Sylvia Niehuis, premarital relationships, transition from courtship to marriage, marriage preparation, prediction of marital outcomes, longitudinal research methods
Maria C. Norton, geriatric mental health, psychosocial and biological factors, research methodology and epidemiology
Linda M. Skogrand, families from diverse populations, transcending traumatic childhoods, marriage and family education

Adjunct Assistant Professor

Carol M. Baumann, child welfare, foster care, adoption

Adjunct Research Assistant Professor

Lisa K. Boyce, infancy and early childhood, language development, parent-child interaction

Senior Lecturer

Deborah B. Ascione, marriage, human development, child abuse and neglect

Lecturers

Jana Darrington, adult development and aging, relationship development, family policy
Susan L. Erickson, undergraduate practicum coordinator, marriage and family therapy, professional development
Alena Johnson, family financial management, financial counseling, students and debt
Farol Ann G. Nelson, early childhood education, child development, parent education, experiences in the arts for early childhood
Kaelin Olsen, infant and toddler development, developmentally appropriate practice in early childhood education, preschool curriculum, child guidance

Course Descriptions

Family, Consumer, and Human Development (FCHD), pages 517-520

Department of Forest, Range, and Wildlife Sciences

Department Head: Johan du Toit
Location: Natural Resources 206
Phone: (435) 797-3219
FAX: (435) 797-3796
E-mail: lbarr@cc.usu.edu
WWW: <http://www.cnr.usu.edu/frws>

Undergraduate Advisor:

Maureen A. Wagner, Natural Resources 120, (435) 797-2448,
maureen@cc.usu.edu

Degrees offered: Bachelor of Science (BS) in Conservation and Restoration Ecology; BS, Master of Science (MS), and Doctor of Philosophy (PhD) in Forestry; BS in Rangeland Resources; BS in Wildlife Science; MS and PhD in Ecology; MS and PhD in Range Science; and MS and PhD in Wildlife Biology

Graduate specializations: *MS, PhD in Ecology*—Conservation Biology, Wildlife Ecology; *MS, PhD in Wildlife Biology*—Conservation Biology, Problem Wildlife Management, Wildlife Management

Undergraduate Programs

Objectives

The Department of Forest, Range, and Wildlife Sciences (FRWS) offers four undergraduate degrees: Conservation and Restoration Ecology, Forestry, Rangeland Resources, and Wildlife Science. These degree programs offer broad educational opportunities for students interested in the analysis and management of forest and rangeland ecosystems and their associated wildlife populations. The department's philosophy of education is to promote a broad interdisciplinary approach to natural resources analysis, management, and science.

The first two years of study in the Department of Forest, Range, and Wildlife Sciences are designed to provide students with a sound background in the natural sciences, an introduction to the field of natural resources management, and an introduction to their respective major. The last two years are designed to provide an advanced understanding of natural resource management and science, depth concentration in the major, and experience with the integration of scientific and management concepts across a diversity of disciplines and management scenarios. Students are expected to enroll for 15 or more credits of coursework per semester.

Career Opportunities

Graduates in Forest, Range, and Wildlife Sciences (FRWS) qualify for a broad range of career opportunities specific to their major. The Bachelor of Science degrees in Forestry, Rangeland Resources, and Wildlife Science are designed to meet the U.S. Office of Personnel Management (OPM) requirements for professional, permanent, full-time jobs with the Forest Service, Fish and Wildlife Service, Bureau of Land Management, National Park Service, or other federal natural resources agencies. The Bachelor of Science in Conservation and Restoration Ecology is designed to meet OPM requirements for Ecologist, but is flexible and intended to meet the needs of nongovernmental careers as well, such as the Nature Conservancy or private natural resource consulting firms, as well as state and county restoration and management agencies. Graduates in all degree programs receive a solid background in biological and quantitative sciences, as well as the communication skills needed to succeed in many career paths.

Requirements

Admission Requirements

Admission requirements for the Department of Forest, Range, and Wildlife Sciences are the same as those described for the College of Natural Resources on pages 117-118.

Graduation Requirements

All *General Science Foundation Courses*, *Departmental Common Courses*, and all courses listed as major subject courses must be taken on an *A-B-C-D-F* basis. A grade of *C-* or better is required for all Forest, Range, and Wildlife Sciences courses used to meet the requirements for a major or minor in the department. The grade point average for all courses taught by the College of Natural Resources must be 2.5 or higher.

In addition to completing the University Studies course requirements (see pages 46-54), all students earning an undergraduate degree in the Department of Forest, Range, and Wildlife Sciences must complete the *General Science Foundation Courses* and the *Departmental Common Courses*, as listed below. Some of these courses may be used toward the University Studies requirements, as indicated by the University Studies designations listed in parentheses following the course numbers.

A. General Science Foundation Courses (34 credits)

BIOL 1210 Biology I (F).....	4
BIOL 1220 (BLS) Biology II (Sp).....	4
MATH 1050 (QL) College Algebra (F,Sp,Su).....	4
MATH 1100 (QL) Calculus Techniques (F,Sp,Su).....	3
SOIL 3000 Fundamentals of Soil Science (F,Sp).....	4
STAT 2000 (QI) Statistical Methods (F,Sp,Su) (3 cr) or	
STAT 3000 (QI) Statistics for Scientists (F,Sp) (3 cr).....	3
NR 2220 General Ecology (F,Sp).....	3

Select one of the following chemistry series (9 credits):

CHEM 1110 (BPS) General Chemistry I (F,Sp).....	4
CHEM 1130 General Chemistry Laboratory (Sp).....	1
CHEM 1120 (BPS) General Chemistry II (Sp).....	4
OR	
CHEM 1210 Principles of Chemistry I (F,Sp).....	4
CHEM 1230 Chemical Principles Laboratory I (F,Sp).....	1
CHEM 1220 (BPS) Principles of Chemistry II (F,Sp,Su).....	4

B. Departmental Common Courses (28 credits)

FRWS 2000 Introduction to Forest, Range, and Wildlife Sciences (F).....	1
FRWS 3600 Wildland Plant Ecology and Identification (F).....	4
FRWS 3610 Wildland Animal Ecology and Identification (F).....	4
FRWS 3700 (CI) Inventory and Assessment in Natural Resource and Environmental Management (F).....	3
FRWS 3710 Monitoring and Assessment in Natural Resource and Environmental Management (Sp).....	3
FRWS 3800 Wildland Ecosystems (Sp).....	3
FRWS 3810 Plant and Animal Populations (Sp).....	3
FRWS 3850 Vegetation and Habitat Management (F).....	3
FRWS 3900 Managing Dynamic Ecological Systems (Sp).....	4

Bachelor of Science in Conservation and Restoration Ecology

Students in the Conservation and Restoration Ecology major must meet the course requirements for University Studies, as well as complete the *General Science Foundation Courses* and the *Departmental Common Courses* listed above. They must also complete 13 credits of Degree Program Courses, as follows:

Department of Forest, Range, and Wildlife Sciences

A. Degree Program Courses (13 credits)

ENVS 3000 Natural Resources Policy and Economics (F)	4
ENVS 4000 (DSS) Human Dimensions of Natural Resource Management (F)	3
FRWS 4600 Conservation Biology (F)	3
FRWS 4700 Ecological Foundations of Restoration (Sp)	3

In addition, they must complete a 21-credit specialization, which is designed by the student in consultation with a faculty advisor to meet specific goals and career objectives and must be approved by the FRWS department head.

B. Degree Program Electives (21 credits)

Students in the Conservation and Restoration Ecology major must meet with their advisor and plan a program of study for their 21 credits of degree program electives. Students must identify an organizing theme or comprehensive plan to guide the selection of their degree program electives, and all courses counted toward this requirement must be approved in advance by the student's advisor. Courses taken to complete a dual major with another major within the College of Natural Resources may *not* be counted toward fulfillment of this requirement.

C. Free Elective Credits (24 credits)

Students may take the remainder of the 120 credits from any department. Courses which meet General Education "Breadth Requirements" and University Studies "Depth Education Requirements" should be included to ensure meeting General Education and University Studies Requirements.

Note: Students wanting to pursue federal employment should check the following U.S. Office of Personnel Management website for a listing of required coursework:

<http://www.opm.gov/qualifications/SEC-IV/B/GS0400/0408.HTM>

Conservation and Restoration Ecology Major Recommended Four-Year Plan of Study

Students should meet regularly with their faculty advisor and carefully plan their academic program, keeping in mind that many upper-division courses have prerequisites and must be taken in sequence. Students following the recommended schedule listed below should be able to complete degree requirements in four years (eight semesters).

A. First Year (28 credits)

Fall Semester (14 credits)

BIOL 1210 Biology I	4
ENGL 1010 (CL) Introduction to Writing: Academic Prose	3
ENVS 2340 (BSS) Natural Resources and Society (recommended)	3
FRWS 2000 Introduction to Forest, Range, and Wildlife Sciences	1
USU 1300 (BAI) U.S. Institutions (or other approved Breadth American Institutions course)	3

Spring Semester (14 credits)

BIOL 1220 (BLS) Biology II	4
MATH 1050 (QL) College Algebra	4
USU 1320 (BHU) Civilization: Humanities (or other approved Breadth Humanities course)	3
USU 1330 (BCA) Civilization: Creative Arts (or other approved Breadth Creative Arts course)	3

B. Second Year (31 credits)

Fall Semester (14 credits)

CHEM 1110 (BPS) General Chemistry I	4
CHEM 1130 General Chemistry Laboratory	1
OR	
CHEM 1210 Principles of Chemistry I	4
CHEM 1230 Chemical Principles Laboratory I	1

MATH 1100 (QL) Calculus Techniques	3
NR 2220 General Ecology	3
Approved Depth Humanities and Creative Arts (DHA) course	3

Spring Semester (17 credits)

CHEM 1120 (BPS) General Chemistry II	4
OR	
CHEM 1220 (BPS) Principles of Chemistry II	4

ENGL 2010 (CL) Intermediate Writing: Research Writing in a Persuasive Mode	3
SOIL 3000 Fundamentals of Soil Science	4
STAT 2000 (QI) Statistical Methods (3 cr) or	
STAT 3000 (QI) Statistics for Scientists (3 cr)	3
Elective Course(s)	3

C. Third Year (30 credits)

Fall Semester (14 credits)

FRWS 3600 Wildland Plant Ecology and Identification	4
FRWS 3610 Wildland Animal Ecology and Identification	4
FRWS 3700 (CI) Inventory and Assessment in Natural Resource and Environmental Management	3
FRWS 3850 Vegetation and Habitat Management	3

Spring Semester (16 credits)

FRWS 3710 Monitoring and Assessment in Natural Resource and Environmental Management	3
FRWS 3800 Wildland Ecosystems	3
FRWS 3810 Plant and Animal Populations	3
FRWS 3900 Managing Dynamic Ecological Systems	4
Elective Course(s)	3

D. Fourth Year (31 credits)

Fall Semester (16 credits)

ENVS 3000 Natural Resources Policy and Economics	4
ENVS 4000 (DSS) Human Dimensions of Natural Resource Management	3
Elective Courses	9

Spring Semester (15 credits)

FRWS 4600 Conservation Biology	3
FRWS 4700 Ecological Foundations of Restoration	3
Elective Courses	9

Bachelor of Science in Forestry

Students in the Forestry major must meet the course requirements for University Studies, as well as complete the *General Science Foundation Courses* and the *Departmental Common Courses* listed above. They must also complete 32 credits of *Professional Coursework*, including the following:

A. Professional Coursework (32 credits)

AWER 3700 (CI) Fundamentals of Watershed Science (Sp)	3
AWER 4930 Geographic Information Systems (F)	4
ENVS 3300 Fundamentals of Recreation Resources Management (F)	3
ENVS 4000 (DSS) Human Dimensions of Natural Resource Management (F)	3
ENVS 4400 Economic Applications in Natural Resource Management (Sp)	4
FRWS 4520 Wildland Fire Management and Planning (F)	2
FRWS 5350 Wildland Soils (Sp)	3
FRWS 5420 (CI) Forest and Shade Tree Pathology (Sp)	3
FRWS 5510 Forest Entomology (F)	2
FRWS 5700 Forest Assessment and Management (Sp)	3
FRWS 5750 Applied Remote Sensing (F)	3

Department of Forest, Range, and Wildlife Sciences

B. Electives (26 credits)

Students may take the remainder of the 120 credits from any department. Courses which meet General Education "Breadth Requirements" and University Studies "Depth Education Requirements" should be included to ensure meeting University Studies Requirements.

Note: Students wanting to pursue federal employment should check the following U.S. Office of Personnel Management website for a listing of required coursework:

<http://www.opm.gov/qualifications/SEC-IV/B/GS0400/0460.HTM>

Forestry Major Recommended Four-Year Plan of Study

Students should meet regularly with their faculty advisor and carefully plan their academic program, keeping in mind that many upper-division courses have prerequisites and must be taken in sequence. Students following the recommended schedule listed below should be able to complete degree requirements in four years (eight semesters).

A. First Year (28 credits)

Fall Semester (14 credits)

BIOL 1210 Biology I	4
ENGL 1010 (CL) Introduction to Writing: Academic Prose	3
ENVS 2340 (BSS) Natural Resources and Society (recommended)	3
FRWS 2000 Introduction to Forest, Range, and Wildlife Sciences	1
USU 1300 (BAI) U.S. Institutions (or other approved Breadth American Institutions course)	3

Spring Semester (14 credits)

BIOL 1220 (BLS) Biology II	4
MATH 1050 (QL) College Algebra	4
USU 1320 (BHU) Civilization: Humanities (or other approved Breadth Humanities course)	3
USU 1330 (BCA) Civilization: Creative Arts (or other approved Breadth Creative Arts course)	3

B. Second Year (31 credits)

Fall Semester (14 credits)

CHEM 1110 (BPS) General Chemistry I	4
CHEM 1130 General Chemistry Laboratory	1
OR	
CHEM 1210 Principles of Chemistry I	4
CHEM 1230 Chemical Principles Laboratory I	1
MATH 1100 (QL) Calculus Techniques	3
NR 2220 General Ecology	3
Approved Depth Humanities and Creative Arts (DHA) course	3

Spring Semester (17 credits)

CHEM 1120 (BPS) General Chemistry II	4
OR	
CHEM 1220 (BPS) Principles of Chemistry II	4
ENGL 2010 (CL) Intermediate Writing: Research Writing in a Persuasive Mode	3
SOIL 3000 Fundamentals of Soil Science	4
STAT 2000 (QI) Statistical Methods (3 cr) or	
STAT 3000 (QI) Statistics for Scientists (3 cr)	3
Elective Course(s)	3

C. Third Year (30 credits)

Fall Semester (14 credits)

FRWS 3600 Wildland Plant Ecology and Identification	4
FRWS 3610 Wildland Animal Ecology and Identification	4
FRWS 3700 (CI) Inventory and Assessment in Natural Resource and Environmental Management	3
FRWS 3850 Vegetation and Habitat Management	3

Spring Semester (16 credits)

AWER 3700 (CI) Fundamentals of Watershed Science	3
FRWS 3710 Monitoring and Assessment in Natural Resource and Environmental Management	3
FRWS 3800 Wildland Ecosystems	3
FRWS 3810 Plant and Animal Populations	3
FRWS 3900 Managing Dynamic Ecological Systems	4

D. Fourth Year (34 credits)

Fall Semester (17 credits)

AWER 4930 Geographic Information Systems	4
ENVS 3300 Fundamentals of Recreation Resources Management	3
ENVS 4000 (DSS) Human Dimensions of Natural Resource Management	3
FRWS 4520 Wildland Fire Management and Planning	2
FRWS 5510 Forest Entomology	2
FRWS 5750 Applied Remote Sensing	3

Spring Semester (17 credits)

ENVS 4400 Economic Applications in Natural Resource Management	4
FRWS 5350 Wildland Soils	3
FRWS 5420 (CI) Forest and Shade Tree Pathology	3
FRWS 5700 Forest Assessment and Management	3
Elective Course(s)	4

Bachelor of Science in Rangeland Resources

Students in the Rangeland Resources major must meet the course requirements for University Studies, as well as complete the *General Science Foundation Courses* and the *Departmental Common Courses* listed above. They must also complete 29 credits of *Professional Coursework*, including the following:

A. Professional Coursework (29 credits)

ADVS 2080 Beef Production Practices (Sp) (2 cr) or	
ADVS 2090 Sheep Production Practices (Sp) (2 cr)	2
AWER 3700 (CI) Fundamentals of Watershed Science (Sp)	3
BIOL 4400 (QI) Plant Physiology (F)	4
BIOL 4420 Plant Taxonomy (Sp)	3
ENVS 3000 Natural Resources Policy and Economics (F)	4
ENVS 4000 (DSS) Human Dimensions of Natural Resource Management (F)	3
ENVS 5000 Collaborative Problem-Solving for Environment and Natural Resources (Sp)	3
FRWS 4000 Principles of Rangeland Management (Sp)	3
SOIL 5130 Soil Genesis, Morphology, and Classification (F)	4

B. Electives (29 credits)

Students may take the remainder of the 120 credits from any department. Courses which meet General Education "Breadth Requirements" and University Studies "Depth Education Requirements" should be included to ensure meeting University Studies Requirements.

Note: Students wanting to pursue federal employment should check the following U.S. Office of Personnel Management website for a listing of required coursework:

<http://www.opm.gov/qualifications/SEC-IV/B/GS0400/0454.HTM>

Rangeland Resources Major

Recommended Four-Year Plan of Study

Students should meet regularly with their faculty advisor and carefully plan their academic program, keeping in mind that many upper-division courses have prerequisites and must be taken in sequence. Students following the recommended schedule listed below should be able to complete degree requirements in four years (eight semesters).

Department of Forest, Range, and Wildlife Sciences

A. First Year (28 credits)

Fall Semester (14 credits)

BIOL 1210 Biology I	4
ENGL 1010 (CL) Introduction to Writing: Academic Prose	3
ENVS 2340 (BSS) Natural Resources and Society (recommended)....	3
FRWS 2000 Introduction to Forest, Range, and Wildlife Sciences	1
USU 1300 (BAI) U.S. Institutions (or other approved Breadth American Institutions course)	3

Spring Semester (14 credits)

BIOL 1220 (BLS) Biology II.....	4
MATH 1050 (QL) College Algebra.....	4
USU 1320 (BHU) Civilization: Humanities (or other approved Breadth Humanities course)	3
USU 1330 (BCA) Civilization: Creative Arts (or other approved Breadth Creative Arts course)	3

B. Second Year (30 credits)

Fall Semester (14 credits)

CHEM 1110 (BPS) General Chemistry I	4
CHEM 1130 General Chemistry Laboratory	1
OR	
CHEM 1210 Principles of Chemistry I	4
CHEM 1230 Chemical Principles Laboratory I	1

MATH 1100 (QL) Calculus Techniques	3
NR 2220 General Ecology.....	3
Approved Depth Humanities and Creative Arts (DHA) course	3

Spring Semester (16 credits)

ADVS 2080 Beef Production Practices (2 cr) or	
ADVS 2090 Sheep Production Practices (2 cr).....	2

CHEM 1120 (BPS) General Chemistry II	4
OR	
CHEM 1220 (BPS) Principles of Chemistry II	4

ENGL 2010 (CL) Intermediate Writing: Research Writing in a Persuasive Mode.....	3
SOIL 3000 Fundamentals of Soil Science.....	4
STAT 2000 (QI) Statistical Methods (3 cr) or	
STAT 3000 (QI) Statistics for Scientists (3 cr)	3

C. Third Year (30 credits)

Fall Semester (14 credits)

FRWS 3600 Wildland Plant Ecology and Identification	4
FRWS 3610 Wildland Animal Ecology and Identification	4
FRWS 3700 (CI) Inventory and Assessment in Natural Resource and Environmental Management	3
FRWS 3850 Vegetation and Habitat Management.....	3

Spring Semester (16 credits)

AWER 3700 (CI) Fundamentals of Watershed Science.....	3
FRWS 3710 Monitoring and Assessment in Natural Resource and Environmental Management	3
FRWS 3800 Wildland Ecosystems.....	3
FRWS 3810 Plant and Animal Populations	3
FRWS 3900 Managing Dynamic Ecological Systems	4

D. Fourth Year (32 credits)

Fall Semester (15 credits)

BIOL 4400 (QI) Plant Physiology	4
ENVS 3000 Natural Resources Policy and Economics.....	4
ENVS 4000 (DSS) Human Dimensions of Natural Resource Management	3
SOIL 5130 Soil Genesis, Morphology, and Classification	4

Spring Semester (17 credits)

BIOL 4420 Plant Taxonomy	3
ENVS 5000 Collaborative Problem-Solving for Environment and Natural Resources.....	3
FRWS 4000 Principles of Rangeland Management	3
Elective Courses	8

Bachelor of Science in Wildlife Science

Students in the Wildlife Science major must meet the course requirements for University Studies, as well as complete the *General Science Foundation Courses* and the *Departmental Common Courses* listed above. They must also complete 28 credits of Degree Program Courses, including the following:

A. Degree Program Courses (28 credits)

BIOL 5250 (CI) Evolutionary Biology (F).....	3
BIOL 5560 Ornithology (Sp) (3 cr) or	
BIOL 5570 Herpetology (Sp) (3 cr)	3
BIOL 5580 Mammalogy (F).....	3
ENVS 3000 Natural Resources Policy and Economics (F)	4
ENVS 4000 (DSS) Human Dimensions of Natural Resource Management (F).....	3
FRWS 3300 Management Aspects of Wildlife Behavior (Sp).....	3
FRWS 4500 Principles of Wildlife Management (Sp).....	3
FRWS 4600 Conservation Biology (Sp)	3
FRWS 4880 Genetics in Conservation and Management (F)	3

B. Electives (30 credits)

Students may take the remainder of the 120 credits from any department. Courses which meet General Education "Breadth Requirements" and University Studies "Depth Education Requirements" should be included to ensure meeting University Studies Requirements.

Note: Students wanting to pursue federal employment should check the following U.S. Office of Personnel Management website for a listing of required coursework:

<http://www.opm.gov/qualifications/SEC-IV/B/GS0400/0486.HTM>

Wildlife Science Major Recommended

Four-Year Plan of Study

Students should meet regularly with their faculty advisor and carefully plan their academic program, keeping in mind that many upper-division courses have prerequisites and must be taken in sequence. Students following the recommended schedule listed below should be able to complete degree requirements in four years (eight semesters).

A. First Year (28 credits)

Fall Semester (14 credits)

BIOL 1210 Biology I	4
ENGL 1010 (CL) Introduction to Writing: Academic Prose	3
ENVS 2340 (BSS) Natural Resources and Society (recommended)....	3
FRWS 2000 Introduction to Forest, Range, and Wildlife Sciences	1
USU 1300 (BAI) U.S. Institutions (or other approved Breadth American Institutions course)	3

Spring Semester (14 credits)

BIOL 1220 (BLS) Biology II.....	4
MATH 1050 (QL) College Algebra.....	4
USU 1320 (BHU) Civilization: Humanities (or other approved Breadth Humanities course)	3
USU 1330 (BCA) Civilization: Creative Arts (or other approved Breadth Creative Arts course)	3

Department of Forest, Range, and Wildlife Sciences

B. Second Year (31 credits)

Fall Semester (14 credits)

CHEM 1110 (BPS) General Chemistry I	4
CHEM 1130 General Chemistry Laboratory	1
OR	
CHEM 1210 Principles of Chemistry I	4
CHEM 1230 Chemical Principles Laboratory I	1

MATH 1100 (QL) Calculus Techniques	3
NR 2220 General Ecology	3
Approved Depth Humanities and Creative Arts (DHA) course	3

Spring Semester (17 credits)

CHEM 1120 (BPS) General Chemistry II	4
OR	
CHEM 1220 (BPS) Principles of Chemistry II	4
ENGL 2010 (CL) Intermediate Writing: Research Writing in a Persuasive Mode	3
SOIL 3000 Fundamentals of Soil Science	4
STAT 2000 (QI) Statistical Methods (3 cr) or	
STAT 3000 (QI) Statistics for Scientists (3 cr)	3
Elective Course(s)	3

C. Third Year (30 credits)

Fall Semester (14 credits)

FRWS 3600 Wildland Plant Ecology and Identification	4
FRWS 3610 Wildland Animal Ecology and Identification	4
FRWS 3700 (CI) Inventory and Assessment in Natural Resource and Environmental Management	3
FRWS 3850 Vegetation and Habitat Management	3

Spring Semester (16 credits)

FRWS 3300 Management Aspects of Wildlife Behavior	3
FRWS 3710 Monitoring and Assessment in Natural Resource and Environmental Management	3
FRWS 3800 Wildland Ecosystems	3
FRWS 3810 Plant and Animal Populations	3
FRWS 3900 Managing Dynamic Ecological Systems	4

D. Fourth Year (31 credits)

Fall Semester (16 credits)

BIOL 5580 Mammalogy	3
ENVS 3000 Natural Resources Policy and Economics	4
ENVS 4000 (DSS) Human Dimensions of Natural Resource Management	3
FRWS 4880 Genetics in Conservation and Management	3
Elective Course(s)	3

Spring Semester (15 credits)

BIOL 5250 (CI) Evolutionary Biology	3
BIOL 5560 Ornithology (3 cr) or	
BIOL 5570 Herpetology (3 cr)	3
FRWS 4500 Principles of Wildlife Management	3
FRWS 4600 Conservation Biology	3
Elective Course(s)	3

Financial Assistance

The main opportunities for undergraduates to find financial support through grants, work-study, and loans are listed on pages 23-27 in the *Financial Aid and Scholarship Information* section. In addition, more than 30 scholarships are available for eligible students in the College of Natural Resources. Some students may be able to find paid internships with private or governmental organizations, or work for a faculty

member on a research project. Interested persons should contact the college's Academic Service Center for more information on financial assistance for undergraduate students.

Departmental Honors

Students who would like to experience greater academic depth within their major are encouraged to enroll in departmental honors. Through original, independent work, Honors students enjoy the benefits of close supervision and mentoring, as they work one-on-one with faculty in select upper-division departmental courses. Honors students also complete a senior project, which provides another opportunity to collaborate with faculty on a problem that is significant, both personally and in the student's discipline. Participating in departmental honors enhances students' chances for obtaining fellowships and admission to graduate school. Minimum GPA requirements for participation in departmental honors vary by department, but usually fall within the range of 3.30-3.50. Students may enter the Honors Program at almost any stage in their academic career, including at the junior (and sometimes senior) level. The campus-wide Honors Program, which is open to all qualified students regardless of major, offers a rich array of cultural and social activities, special classes, and the benefit of Honors early registration. Interested students should contact the Honors Program, Merrill Library 374, (435) 797-2715, honors@cc.usu.edu. Additional information can be found online at: <http://www.usu.edu/honors/>

Additional Information

The undergraduate program may be tailored to individual student needs with the help of a faculty advisor. For additional information about the degree requirements, course sequencing, and departmental specialization options and their related coursework, as well as updated information describing current programs and courses offered by the Department of Forest, Range, and Wildlife Sciences, visit the Forest, Range, and Wildlife Sciences main office, Natural Resources 206, or visit: <http://www.cnr.usu.edu/frws>

Major requirement sheets, which outline career opportunities and required courses for departmental majors, can be obtained from the department, or online at: <http://www.usu.edu/ats/majorsheets/>

Graduate Programs

Admission Requirements

The Department of Forest, Range, and Wildlife Sciences offers opportunities for graduate study through MS and PhD degree programs in Ecology, Forestry, Range Science, and Wildlife Biology. The department also offers opportunities to participate in a college-wide Master of Natural Resources (MNR) degree program administered through the College of Natural Resources. The MNR is described more fully on page 369.

The programs of instruction and research leading to graduate degrees in the department are available only to students meeting high scholastic standards who are accepted for study by the departmental faculty. Students desiring entrance to these graduate programs should contact the department head for information concerning eligibility.

USU School of Graduate Studies general admission requirements are described on pages 93-94. Applicants for graduate study in the department should have a bachelor's degree from an accredited

Department of Forest, Range, and Wildlife Sciences

college or university, a cumulative GPA of at least 3.0 (out of 4.0), and GRE scores (quantitative and verbal) above the 40th percentile. Foreign students should submit a TOEFL score of at least 550. Exceptions to these standards will be considered on a case-by-case basis. Written statements of interest help match applicants with faculty advisors. A faculty member must agree to serve as the major professor in order for an applicant to be accepted for study. Prospective students are encouraged to contact faculty members early in the application process to investigate mutual interests, projects, and prospects for financial support.

A natural resources baccalaureate degree is not required for admission to the department, although a sound background in the natural sciences is strongly recommended. Students lacking the requisite background will work with their supervisory committee to address deficiencies.

Degree Programs

The MS degree is offered for students motivated toward a management or administrative career in natural resources management. The MS may be obtained through either a Plan A (research thesis) or Plan B (nonthesis) program, as described on page 98. The **Plan A** option requires a thesis based on original research conducted by the student. The **Plan B** option is recommended for professional forestry, rangeland, or wildlife managers who do not desire research training. The PhD degree is intended for students seeking a natural resources research or academic career. Comprehensive exams (both oral and written) are required in the doctoral program.

The minimum requirement for an MS degree is 30 credits, including at least 24 credits in residency and 6 credits of thesis research. The minimum requirement for a PhD degree is 60 approved graduate credits in addition to an MS degree, or 90 approved graduate credits with no MS degree. At least one year (a minimum of 32 credits), including a minimum of two consecutive semesters, of full-time registration must be in residence at USU.

With committee approval, graduate credit may be transferred from accredited graduate schools, provided the minimum residency requirement (including thesis and dissertation credit) at USU is met. Transfer credit, which must not have been used for any other degree, will be shown on official USU transcripts at completion of the degree.

Research

Cooperation with other departments and research centers of the University, as well as with government collaborators, permits strong graduate programs in all aspects of forest, range, and wildlife-related sciences. Particular mention should be made of the USU Ecology Center, in which the Forest, Range, and Wildlife Sciences Department is very active; the Utah Agricultural Experiment Station, which has a full program in both applied and basic research; the Utah Cooperative Fisheries and Wildlife Research Unit; the Predator Ecology and Behavior Field Station; the Jack H. Berryman Institute; the U.S. Forest Service Rocky Mountain Forest and Range Experiment Station; and the USDA Agricultural Research Service.

Financial Assistance

General aspects of financial support for graduate students at Utah State University are listed on pages 92-93 in the *Graduate Financial Assistance* section. This includes important information on the University-wide policies and terms of reference for research and

teaching assistantships, graduate tuition obligations and benefits, Western Regional Graduate Programs, and competitive University-wide fellowships and scholarships. The College of Natural Resources also offers a limited number of Quinney Doctoral Fellowships for incoming doctoral students.

Graduate research assistantships may be available on a competitive basis to both MS and PhD students through major professors having contracts, grants, or other awards from the University, private sector, or government agencies. These assistantships vary in the amount of support offered, but they commonly offer a stipend to help cover living expenses and operating funds to carry out the research. Other benefits may include assistance with tuition and student health insurance, as well as opportunities to travel.

The department also has a few graduate teaching assistantships for students who help with teaching, grading, or recitation in large courses. These typically pay only a modest supplement on a semester basis, however, and are not sufficient to cover living expenses. Domestic PhD students on a research assistantship in some departmental degree programs are required to hold at least one teaching assistantship during their program, to obtain experience in classroom (mainly undergraduate) instruction. MS students may also hold teaching assistantships, contingent upon availability of funds. Acceptance to pursue graduate study does not guarantee the student financial assistance.

Additional Information

For more information about graduate programs and departmental faculty and their research emphasis areas, as well as updated information describing current programs and courses offered by the Department of Forest, Range, and Wildlife Sciences, visit the Forest, Range, and Wildlife Sciences main office, Natural Resources 206, or visit <http://www.cnr.usu.edu/frws>

Forest, Range, and Wildlife Sciences Faculty

Professors

John A. Bissonette, Leader, Utah Cooperative Fish and Wildlife Research Unit, landscape ecology, terrestrial vertebrate ecology
F. E. "Fee" Busby, Dean of College of Natural Resources, effects of livestock grazing

Martyn M. Caldwell, Director Ecology Center, plant physiological ecology

Michael R. Conover, animal behavior, wildlife damage management

Raymond D. Dueser, conservation ecology

James N. Long, forest ecology, silviculture

John C. Malechek, rangeland management

Terry A. Messmer, fisheries and wildlife extension specialist, wild ungulate and waterfowl management, wetlands ecology, private land management, conservation communication

Frederick D. Provenza, range animal production

Michael L. Wolfe, wildlife ecology and management

Research Professors

Michael M. Jaeger, behavioral ecology

Frederick F. Knowlton, Predator Ecology and Behavior Project, predator ecology, behavior and management

Jesse A. Logan, forest insect ecology, disturbance ecology, dynamical systems analysis

Leila McReynolds Shultz, plant taxonomy and geography

Department of Forest, Range, and Wildlife Sciences

Adjunct Professors

Barbara H. Allen-Diaz, plant community ecology
Gary E. Belovsky, population ecology
James E. Bowns, range ecology
John W. Connelly, upland game ecology, conservation, management
Norbert V. DeByle, forest ecology
Douglas A. Johnson, plant ecophysiology
Jerran T. Flinders, range science and wildlife ecology
David W. Roberts, forest ecology, forest modeling, vegetation ecology
Scott R. Winterstein, wildlife population dynamics and management

Professors Emeriti

Thadis W. Box, range management
John A. Kadlec, wetlands ecology, wildlife management
Ronald M. Lanner, forest genetics, dendrology
Frederic H. Wagner, wildlife ecology, natural resources policy
Neil E. West, rangeland desertification/condition/trend
John P. Workman, range economics

Associate Professors

Frederick A. Baker, forest pathology, computer applications
Roger E. Banner, range extension specialist
Christopher A. Call, vegetation manipulation/management
Thomas C. Edwards, Jr., Utah Cooperative Fish and Wildlife Research Unit, spatial ecology, habitat modelling, biostatistics
Michael J. Jenkins, disturbance ecology and management, insects, fire, snow avalanches
Michael R. Kuhns, forestry extension specialist, urban forestry, tree physiology
R. Douglas Ramsey, remote sensing, geographic information systems, landscape ecology, spatial analysis
Eugene W. Schupp, plant population ecology and restoration ecology
Helga Van Miegroet, forest soils and biogeochemistry

Research Associate Professors

Eric M. Gese, Predator Ecology and Behavior Field Station, predator behavior and ecology
John A. Shivik, predator ecology

Adjunct Associate Professors

Dale L. Bartos, range ecology
Mark W. Brunson, social and psychological aspects of forest and rangeland management
David C. Chojnacky, forest mensuration
D. Layne Coppock, animal production systems/technology transfer and international pastoral development
John L. Crane Jr., environmental resource management
Thomas A. Jones, native grass breeding
Bruce A. Kimball, range ecology
Niki S. Nicholas, biogeochemistry

Kenneth C. Olson, grazing livestock nutrition
James A. Pfister, poisonous range plants
Michael H. Ralphs, poisonous plants/grazing management
Robert H. Schmidt, wildlife policy, wildlife damage management

Associate Professors Emeriti

Brien E. (Ben) Norton, grazing ecology, international range management
Gar W. Workman, wildlife ecology and management

Assistant Professors

Karen H. Beard, community ecology, ecosystem ecology, conservation biology
Karen E. Mock, conservation genetics and applied molecular ecology
Ronald J. Ryel, plant physiological ecology

Research Assistant Professors

Barbara J. Bentz, forest entomology
Juan J. Villalba, foraging behavior

Adjunct Assistant Professors

Larry M. Conner, wildlife ecologist, wildlife damage management, mammalogist
Mary M. Conner, quantitative ecology and estimation of population parameters
Charles G. Johnson, Jr., plant and community ecology
Kyran E. Kunkel, carnivores, predator/prey ecology, mammal restoration ecology
Chris L. Lauver, range ecology
Nicole L. McCoy, natural resource economics
Thomas A. Monaco, research ecologist
Dale L. Nolte, foraging behavior
William C. Pitt, Acting Station Leader and wildlife research biologist, Predator Ecology and Behavior Field Station
Johanna M. Ward, population dynamics, avian ecology, conservation biology

Assistant Professor Emeritus

Barrie K. Gilbert, wildlife ethology, behavioral ecology

Adjunct Instructors

Jon Keith Schnare, timber harvest planning and logging methods
David Torelli, collaborative processes, natural resources issues management, volunteer management, fundraising
Katherine S. Voth, wildland/urban interface, fire fuels management, student internships

Course Descriptions

Forest, Range, and Wildlife Sciences (FRWS), pages 520-523