

Institution: University of Utah

College, School or Division in which program will be located: College of Mines and Earth Sciences

Department(s) or Area(s) in which program will be located: Department of Geology and Geophysics

Program Title: Earth Science Composite Teaching Major

Recommended classification of instructional programs (CIP) code: \_\_\_\_\_

Area(s) of Emphasis or academic specialty (if appropriate): \_\_\_\_\_

Certificate, Diploma and/or Degree(s) to be awarded: Baccalaureate of Science

Proposed beginning date: Fall 2003

**Institutional Signatures** (as appropriate):

\_\_\_\_\_  
Department Chair

\_\_\_\_\_  
Dean or Division Chair

\_\_\_\_\_  
Applied Technology Director

\_\_\_\_\_  
Graduate School Dean

\_\_\_\_\_  
Chief Academic Officer

\_\_\_\_\_  
President

\_\_\_\_\_  
Date

## **SECTION I The Request**

The University of Utah requests approval to change the name of its baccalaureate degree "Geology Teaching Major" to "Earth Science Composite Teaching Major" effective Fall 2003. This name change has been approved by the Institutional Board of Trustees on (Month \_\_), 2003.

## **SECTION II Program Description**

### **Complete program description**

The Department of Geology and Geophysics together with the College of Education offers a State approved certification program in secondary teacher education. Completion of the Earth Science Teaching Composite Major and pre /professional education coursework leads to endorsements in Physical Science, Earth Science and/or Integrated Science. Students successfully completing the program qualify for the Utah Basic Certificate in Secondary Education.

### **Purpose of the Degree (no change)**

The Earth Science Composite Teaching Major is a streamlined program that provides students with the education and skills needed for employment in secondary education. The program is needed to ease the statewide shortage of Earth Science and Integrated Science secondary education teachers.

### **Admissions Requirements (no change)**

To be considered for the Earth Science Composite Teaching Major 4-year program, students must do the following:

1. Complete a minimum of 30 semester hours of college credit.
2. Declare the major in the Department of Geology and Geophysics.
3. Apply for Teacher Licensure program (College of Education) after completing a minimum of 8 courses in the major.
4. In Senior year, apply for Teacher Licensure Program Cohort Year.

**Student Advisement (no change)**

The Undergraduate Affairs Committee consists of the advisors assigned to each of the Departments Majors (Geology, Geophysics, Environmental Earth Science, Geological Engineering and Earth Science Composite Teaching). The Chair of the committee, which is comprised of full-time faculty members in the Department, is the designated advisor for students in the ESCT major. The designated advisor coordinates issues between the Earth Science Composite Teaching Major and the College of Education.

**Justification for the number of credits**

The number of semester credit hours is being reduced by six credit hours to fall within State and University guidelines.

**External Review Accreditation**

A draft version of this proposal has been sent for review to Brett Moulding in the Utah State Office of Education. A preliminary reply indicates that the program will meet USOE standards and expectations (e-mail comm. 15 Oct. 2002).

**Projected Enrollment**

The current number of majors in the program has reached a low of 1 student. Potential students have elected not to pursue a Geology Teaching Major because the program was excessively long and did not effectively meet endorsement requirements. The program has been updated to addresses these issues and should now be more attractive to transfer students from the Community Colleges who would like to complete a degree in four years. We anticipate that the program grow to ten or more majors. In the last six months we have received five inquiries on the basis of the draft description.

**Expansion of Program**

The current program is being reduced by six credit hours. It is anticipated that this change and the name change will make the program more visible leading to higher enrollments.

**Faculty (no change)**

The impact of the program on the Faculty will remain the same as before. One Faculty member will continue to be the designated program director and academic advisor. A new web resource will streamline advising.

**Staff** (no change)

The impact of the program on the Staff will remain unchanged. Enhanced tracking and assessment tools being developed for the program are web-based and may result in significant efficiency gains.

**Library** (no change)

The impact of the program on the Library will remain the same as before.

**Learning Resources** (no change)

The Department has adequate learning resources in its collections (rocks, minerals, and fossils), field equipment and computer resources. The minor program adjustments will not impact the available learning resources beyond the level maintained in the existing program.

**SECTION III**  
**Need**

**Program Necessity**

This proposal only for a name change is to increase the visibility of the program and align the program name with its content as defined by the Utah State Office of Education.

**Labor Market Demand**

Utah

The *Utah-Statewide Labor Demand and Supply by Occupations 1998-2003* report lists a composite job prospect grade of 'A' for secondary school teachers. In 1998, a total of 10880 secondary teachers were employed in Utah and it was projected that 12,100 would be employed in 2003.

The *Teaching Field Index for Criticality for Utah Career Teaching Scholarship Program*, prepared in December 1998, indicates a criticality level of 3.2 for Earth Science. A criticality of 3.0 to 3.9 represents a moderate shortage.

These considerations indicate that students majoring in Earth Science Composite Teaching should have strong job prospects. The average hourly salary for secondary teachers in Utah was reported to be \$20.63 in 1998. The average annual salary in Utah was \$32,950 in (98-99).

The next decade will see a dramatic rise in the K-12 population and we want to be in the position to supply qualified teachers in this area of the sciences.

### Nationwide

Graduates of an Earth Science baccalaureate program are prepared to teach in public and private schools. The 2000-2001 Occupational Outlook Handbook states that employment for secondary school teachers is expected to grow faster than the average for all occupations through 2008.

The NEA estimated average salary for all public school teachers in 1998-1999 was \$40,582 (most recent published figures).

According to the College of Education and the Utah Office of Higher Education many secondary Earth Science Teachers are Biology Teaching Majors. Biology and other non-Earth Science Teaching Majors obtain an endorsement to teach Earth Science and Integrated Science by taking the required Endorsement courses to broaden their background and increase their job prospects (Interestingly enough, at the University of Utah few if any Biology Teaching Majors take our GEO endorsement courses or our GEO Teaching minor-- their programs is very full.) Instead, they seek to take the endorsement courses at another opportunity. Non-Earth Science majors that are teaching Earth Science tend to wait for an opening in their field of interest and transfer to it as soon as it is practical. In the absence of dedicated Earth Science Teachers, this leaves the Earth Science and Integrated Science position open for another teacher whose training or heart is not necessarily in the Earth Sciences. As a result, Earth Science and Integrated Science teachers in the secondary schools are open to the criticism that they are teaching "outside their area of dedication". This will become more critical in the immediate future when the requirements for "highly qualified" teachers are enforced.

Non-career teachers enter the secondary teaching market through various programs and end up teaching Earth Science by taking the required endorsement courses. Basically, these courses include Earth System Science, Historical Geology and Rocks and Minerals. Because the non-career teachers and current non-Earth Science teachers have 9-5 jobs, they cannot take our courses at the time they are offered. A few years ago this led to the development of a series of short courses offered during the summer through the Museum of Natural History to satisfy the demand. According to Brett Moulding (personal communication) these courses draw

20-30 participants each year. The College of Education reports that more than 50 percent of its students are transfer students from the Community Colleges.

In order to offer a viable Earth Science Composite Teaching program, our Geology Teaching Major must be renamed and aligned to attract both students already at the University of Utah and transfer students.

### **Student Demand**

Demand for teaching degrees in the sciences at the University of Utah is currently extremely low and especially low for Earth Science Teachers. Low demand appears to be driven by: 1) Low expected salaries; 2) An excessively long and cumbersome program; and 3) Lack of coordination with programs in the community colleges. While we cannot do much about the first cause, much can be done about the last two factors. This program together with adjustments being adopted by the College of Education will address the programmatic issues.

### **Similar Programs**

The following schools offer baccalaureate programs in Earth Science Teaching:

Brigham Young University  
Southern Utah University  
Utah State University  
Weber State University  
Utah Valley State College

In terms of required curricula, there are some differences between the revised program for the University of Utah and the programs at the other schools. Like the programs at Utah State University and Southern Utah University, this major is a “composite” major requiring no additional minor. This makes the program more efficient and flexible than the program at Utah Valley State College (Note: a composite major is more broad than a normal major and viewed as consisting of a built in minor, USOE). Nevertheless, the opportunity exists for students to take additional courses to obtain endorsements in other fields as desired with little extra effort and within stated baccalaureate guidelines. The incorporation of several electives is also unique to our program. While satisfying the content standards in the lower division courses the student is encouraged to explore topics of timely and/or personal interest at greater depth in upper division courses. This allows the student to follow their passion without sacrificing basic knowledge.

The Department of Geology and Geophysics has a large proportion of recognized gifted teachers. Its research laboratories are unparalleled in the State. New facilities to come on line in this decade will provide state-of-the art teaching and laboratory space. In addition, its proximity and connections to the Utah Museum of

Natural History provide students with access to wonderful teaching resources. We plan to take advantage of recent national initiatives, such as Earthscope, to increase educational outreach. The Department offers the largest and most diverse faculty to be involved in a Secondary Teaching program in the Earth Sciences. Located on the edge of Salt Lake City, the largest metropolitan area in Utah, the University of Utah may well have the largest pool of potential students within a 30-mile radius of its campus. Students from SLCC would have a close by place in which to further their education in the field of secondary earth science teaching.

### **Collaboration with and Impact on other USHE Institutions**

The curriculum for the revised program was guided by standards set forth by the Utah State Office of Education's for Earth Science, Physical Science and Integrated Science in an ongoing effort to improve all programs in the State.

### **Benefits**

The renamed program is expected to attract more students into the field of Earth Science Teaching and will help satisfy Utah's need for more Secondary Education teachers.

### **Consistency with Institutional Mission**

#### **University of Utah Mission Statement:**

In its role as teaching institution, the University of Utah offers instruction in baccalaureate, masters, and doctoral degree programs. Its colleges, graduate, and professional schools include architecture, business, education, engineering, fine arts, health, humanities, law, medicine, mines and earth sciences, nursing, pharmacy, science, social and behavioral science, and social work. The University commits itself to providing challenging instruction for all its students, from both Utah and other states and nations, and encourages interdisciplinary work and the integration of instruction and research opportunities. It expects and rewards superior teaching and academic excellence among its faculty. It seeks the broad and liberal education of all its students and their familiarity with a changing world.

<<http://www.admin.utah.edu/president/mission.html>>

#### **College of Education Mission Statement:**

The College of Education is preparing tomorrow's educators and educational leaders in a challenging era. Current education challenges include increased public accountability and demands for excellence, growing student diversity in socio-economic status, cultures, linguistics, and exceptionalities, information and technological explosion, educator shortages in some specific disciplines, and powerful economic constraints. These challenges have encouraged an era of educational reform initiatives for K-12 schools and university educator preparation and development programs. It is in this environment of educational challenges and reform that the College of Education promotes a strong research to practice emphasis in its preparation of educators.

Building on a variety of disciplines, College of Education scholars address critical education issues through collaboration with the field of educational practice and across academic and human service disciplines. Because education is an applied discipline, the college of education must encourage norms and standards appropriate to professional schools while maintaining a viable connection to the academy. The faculty's research to practice focus encourages the advancement of knowledge as well as the improvement of educational policy and practice.

The college's educational programs reflect the mutual relevance and interdependence of teaching and research, emphasizing intellectual inquiry and a research to practice focus. Additionally, faculty are committed to serving the diverse needs of children and to lifelong learning. Thus, the college offers a variety of degree, licensure, and professional development programs, targeting the pre-service preparation of educators as well as their on-going professional growth. <<http://www.ed.utah.edu/strategic-plan.htm>>

#### Department of Geology and Geophysics Mission Statement:

The mission of the Department of Geology and Geophysics includes: 1) Training professional earth scientists and geological engineers of the highest caliber. 2) Providing science training for a broad range of university students using examples from earth and environmental science. 3) Generating new knowledge of earth and our environment through basic and applied scientific research. 4) Disseminating knowledge of the earth and our environment to the scientific community, the general public and governmental agencies. 5) Exploring new technology and pedagogy for teaching in earth and environmental sciences, and geological engineering.

A baccalaureate degree in the Earth Science Composite Teaching Major can be used as the entry into a graduate education program or to attain a job teaching Earth Science in secondary schools. This program complements the mission statements of the University, College of Education and Department of Geology and Geophysics.

## **SECTION IV Program and Student Assessment**

### **Program Assessment**

The goals of the revised program Earth Science Composite Teaching Major will be to:

1. Provide students with the knowledge and skills to teach Earth Science.
2. Provide students with the knowledge and skills necessary to obtain an endorsement in Physical Science.



3. Provide students with the knowledge and skills necessary to obtain an endorsement in Earth Science.
4. Provide students with the knowledge and skills necessary to obtain an endorsement in Integrated Science.
5. Provide students with the knowledge and skills to build upon the curricula described by the Utah State Office of Education for the above programs.
6. Provide students with knowledge of math, chemistry, physics, and biology required to understand the earth sciences.

These goals will be reached by specifically listing them in course syllabi. The effectiveness of the program will be assessed in three ways: 1) Interviews with students after the completion of the program; 2) Course reviews administered at the end of each course; and 3) Questionnaire results from principals regarding our graduates' preparedness after their first year of teaching.

As further assessments of the program, the Department will maintain and analyze data on graduation and licensure rates of students who enter the program.

### **Expected Standards of Performance**

The standards of performance for graduates of the Earth Science Composite Teaching Major will be based on the standards of performance for Earth System Science, as defined on the State Office of Education web page (Standards 3600-01 through 3600-08 (<http://www.mines.utah.edu/pyrite/ESCTMweb/standards/ESCTM-state-stan.html>) and NCATE Program Standards (<http://www.mines.utah.edu/pyrite/ESCTMweb/standards/ESCTM-NCATE-stan.html>)).

### **Student Assessment**

Student assessment in the content area will take place during individual courses through exams, written assignments, and class projects. Students will also be assessed during field exercises, student teaching experiences, and by meeting state licensure requirements including the Praxis I and II tests.

### **Continued Quality Improvement**

The program assessment, described above, will be used to evaluate the program for continued quality improvement.

**SECTION V**  
**Finance**

**Budget** (no change)

The budget for the revised program will be the same as that for the original program. Therefore, no new funds will be requested, no reallocations will be made. Costs will not impact current base budgets.

## Appendix A

**New Courses** No new courses will be added.

### **Earth Science Composite Teaching Major Courses**

This major meets State requirements for Earth Science, Physical Science and Integrated Science Teaching Endorsements.

	<u>Course No.</u>	<u>Credit hours</u>
<b>Required Earth Science (GEO Courses):</b>		
Introduction of Earth Systems	GEO 1110	3
Introduction of Earth Systems Lab	GEO 1111	1
Earth Materials I / Lab	GEO 3080	4
Earth Materials II / Lab	GEO 3090	4
Field Methods	GEO 4500	3
Historical Geology	GEO 1220	3
Elective: Choose 1 from	GEO 1XXX	3
Electives: Choose 2 from	GEO 3XXX	6
or	BIOL 1000	3
and	BIOL 2210	3
<b>Other Required Courses Outside of GEO:</b>		
Secondary Science Teaching Methods	TL 5170	3
College Algebra	MATH 1050	4
Introduction to Statistical Inference	MATH 1070	3
General Chemistry I	CHEM 1210	4
General Chemistry I Lab	CHEM 1230	1
General Chemistry I	CHEM 1220	4
General Chemistry I Lab	CHEM 1240	1
College Physics	PHYCS 2010	4
College Physics Lab	PHYCS 2219	1
College Physics	PHYCS 2020	4
College Physics	PHYCS 2229	1
Introduction to Meteorology	METEO 1010	3
Ecology and Global Change	BIOL 1020	3
Choose one of the following:		
The Universe	PHYCS 1070	3
or		
Elementary Astronomy	PHYCS 3060	3
	<b>Total Hours in Science / Math Courses</b>	<b>66</b>

### **Required Education Courses:**

Pre cohort Courses (24 hours): Required for admission to Teaching Major Program

Intro to Teaching	TL 2100	3
Learning and Literacy	EDPS 2110	3
Choose 1 from ECS 2250, 60, 70, 80, 90	ECS 2XXX	3
Ed Applications of Tech for Second Students	TL 5141	3
Tchn Students w/ Disabilities in Gen Ed Setting	SPED 5011	3
Content Area Literacy Instruction	TL5126	3

Introduction to Multicultural Education	ECS4150	3
Choose 1 from: FCS 5230, EDPS 5050, PSYCH 3220, PSYCH 1230		3
Professional Core Courses (21 hours): Required to receive teacher certification		
Curriculum & Assessment in a Diverse Society	TL 5/6410	3
Instruction and Management in a Diverse Society	TL 5/6411	3
Field Practicum: Secondary	TL 5/6490	3
Action Research/Seminar: Secondary	TL 5/6491	3
Student Teaching: Secondary	TL 5/6495	9
	<b>Total Hours in Education</b>	<b>45</b>
	<b>Total Hours Science &amp; Education Requirements</b>	<b>111</b>
<b>Required Education Courses:</b>		
Fine Arts (FF/FI)		6
American Institutions		3
WRTG 2010		3
	<b>Total Additional required Gen Ed. Credits</b>	<b>12</b>
<b>Total hours in Major</b>		<b>123</b>

An explanation of how General Education Requirements are met is given in Appendix B.

## **GEO Course Descriptions from Electronic Catalogue**

### **1000** Architecture of the Earth (3) Fulfills Science Foundation.

Structure and composition of the Earth and the processes that shape it, deduced from geological observation and measurement. Applications of this knowledge to locating and characterizing energy and mineral resources, and to identifying and mitigating geological hazards.

### **1001** Earthquakes and Volcanoes (3) Fulfills Science Foundation.

Occurrence, characteristics, and processes of earthquakes and volcanic eruptions on a global scale interpreted in terms of plate tectonics. Scientific and social aspects of living in earthquake and volcano country. Case histories from the western United States and elsewhere.

### **1002** Global Environmental Change and Natural Resources (3) Fulfills Science Foundation.

The evolution of the lithosphere, hydrosphere and atmosphere on Earth for the past 4.6 billion years using principles of physics, chemistry, biology, and geology. The impact of society on this background of change will be assessed to make quantitative predictions regarding the direction and magnitude of global environmental changes and natural resource availability in the coming centuries. Discussion of public policy questions and current affairs. Two field trips.

### **1003** Rocks and Minerals (3) Fulfills Science Foundation.

Nontechnical examination of the physics and chemistry of rock-forming minerals occurrence and origins of major rock types. Identification and classification of common minerals and rocks. Two lectures and one lab weekly.

### **1006** The World of Dinosaurs (3) Cross listed as BIOL 1006. Fulfills Science Foundation.

Dinosaurs are the most celebrated fossil organisms. These remarkably diverse and successful animals inhabited every major continent, persisted more than 150 million years, and evolved numerous bizarre forms of varying body sizes. This course presents an overview of the major dinosaur groups and places them into temporal, biogeographic, and ecological context. Topics include modes of preservation, feeding adaptations, social behavior, evolution, extinction, and the origin of birds. Dinosaurs are also used as a vehicle to introduce the scientific method.

### **1007** Unstable Ground - Geological Exploration of the Western U.S. (3) Fulfills Science Foundation.

Students will learn about the geology of the western United States and how it affected the exploration, settlement and development of the region. The course will explore historical and contemporary examples of human interaction with the earth and environment, and how earth science provides a framework for addressing related problems and issues.

### **1008** National Parks: Geology Behind the Scenery (3)

Examining and understanding the natural geologic processes that have built and shaped our country's national parks, national monuments, national recreation areas, and national seashores.

### **1110\*** Introduction to Earth Systems (3)

Overview of Earth materials, structure, history and processes from a systems perspective. Methods of geological observation and measurement, and their applications to problems in science and engineering. Must also register for GEO 1111.

### **1111\*** Laboratory for Introduction to Earth Systems (1)

GEO 1110 accompanying laboratory.

### **1220\*** Earth History (3)

Physical and biological history of the earth; development of interactions between the biosphere, lithosphere, and atmosphere; development of major structural and stratigraphic features, introduction to classification of organisms, and to the fossil record.

### **3080\*** Earth Materials I (4) Prerequisite: CHEM 1210. Fulfills Quantitative Intensive BS Course.

Chemical and physical properties of Earth materials: solids (minerals and rocks) and liquids (water and magmas). Hand specimen identification of rock and ore-forming materials, problem solving, laboratory investigations, and computer exercises. Applications to geological, engineering, and environmental problems. Two lectures, two labs weekly. Field trip.

**3090\*** Earth Materials II (4) Prerequisite: GEO 1110 and 3080 and MATH 1210. Fulfills Quantitative Intensive BS Course.

Texture, mineralogy, chemistry, classification, origin, and evolution of igneous, sedimentary, and metamorphic rocks. Laboratories consist of hand-specimen identification of rocks, problem-solving, and interpretation of petrogenetic sites. The hydrologic cycle, water budget, water resources on the earth, and principles of fluid flow. Two lectures, two labs weekly.

**3180** Paleobiology (3) Prerequisite: GEO 1110.

Morphology, taxonomy, evolution, and stratigraphic distribution of fossil animals and plants. Two lectures, one lab weekly.

**3200** Natural Disasters (3) Prerequisite: MATH 1050 and one of GEO 1000, 1001, or 1110. Fulfills Science Integration, Upper-division Communication/Writing, QB

Physical causes, effects and societal response to natural disasters including flooding, earthquakes, volcanic eruptions, hurricanes and tsunamis. Several recent natural disasters are examined in depth to understand the physical processes responsible for them and their effects. The course will focus on laboratory studies of recent natural disasters in order to understand why they occur, what their consequences are, and how we can respond to minimize their impact.

**3250** Geology of Utah (2) Prerequisite: GEO 1110 or 1000.

Physiography and geology of the Utah region. Development of geological features of Utah through time. Origin of rock sequences, economic products, landscape evolution, and mountain building from the perspective of plate tectonics. Evolution of geological exploration and geological thought to the present time.

**3260** Geologic Field Trips in Utah (1) Co-requisite: GEO 3250. Fulfills Science Integration.

Field trips to view and describe geological characteristics of Utah including Lake Bonneville and Great Salt Lake, the Great Basin, the San Rafael Swell, the Overthrust belt, the Wasatch Fault, mineral deposits, mineral and fossil collecting.

**3300** The Water Planet (3) Fulfills Science Integration.

Why is Paris warmer than Boston in the winter? Is religion thicker than water? Is groundwater becoming deeper and saltier? This course will examine the physical and chemical properties of water in the context of societal problems and needs, and the role of water in shaping global climate and civilization. Important properties of water will be explored to understand topical issues. Class project is required. For non-science majors. Field trip.

**3800** The Oceans (3) Prerequisite: GEO 1110 or 1000. Fulfills Science Integration.

Origin and evolution of ocean basins, bottom sediments, physical and chemical properties of sea water, water masses, circulation of surface and deep waters, waves and tides, and life in the ocean.

**4500\*** Field Methods (3) Prerequisite: GEO 3060 and 5760. Fulfills Upper-division Communication/Writing.

Practical field skills applicable to geological, geoengineering, and environmental studies developed through weekly field exercises in the Wasatch Front area. Results presented orally in class and/or in written reports targeted to a variety of potential users, including professional colleagues, government agencies, and the general public.

**Course Description for:**

**Biology:** <http://www.acs.utah.edu/GenCatalog/1034/crsdesc/biol.html>

**Chemistry:** <http://www.acs.utah.edu/GenCatalog/1034/crsdesc/chem.html>

**Physics:** <http://www.acs.utah.edu/GenCatalog/1034/crsdesc/physics.html>

**Math:** <http://www.acs.utah.edu/GenCatalog/1034/crsdesc/math.html>

**Teaching and Learning:** [http://www.acs.utah.edu/GenCatalog/1034/crsdesc/t\\_1.html](http://www.acs.utah.edu/GenCatalog/1034/crsdesc/t_1.html)

\*Required GEO Courses. Note the catalogue description indicates some prerequisites for GEO 3090 and 4500, which are not otherwise identified or counted in the major. The course descriptions for these courses are being revised to allow ESCT majors to take these courses by permission of the instructor. As enrollment builds separate sections will be added.

## Appendix B

### Program Schedule

#### ***SEMESTER 1 (Fall)***

GEO 1110 Earth Systems	3
GEO 1111 Earth Systems Lab	1
MATH 1050 College Algebra	4
American Institutions	3
Fine Arts (FF/FI)	3
BIOL 1020 General Biology	3
<b>Total</b>	<b>17</b>

#### ***SEMESTER 2 (Spring)***

METEO 1010 Meteorology	3
GEO 1220 Historical Geology	3
MATH 1070 Intro to Statistical Inference	3
TL 2100 Introduction to Teaching	3
CHEM 1210 General Chemistry	3
CHEM 1230 General Chemistry Lab	1
<b>Total</b>	<b>16</b>

#### ***SEMESTER 3 (Fall)***

GEO 3080 Earth Materials I	4
CHEM 1220 General Chemistry	4
CHEM 1240 General Chemistry Lab	1
Fine Arts (FF/FI)	3
PHYSICS 3060 Astronomy	3
<b>Total</b>	<b>15</b>

#### ***SEMESTER 4 (Spring)***

GEO 3090 Earth Materials II	4
ECS 2XXX Ethnic Studies	3
PHYSICS 2010 General Physics	4
PHYSICS 2019 General Physics Lab	1
WRTG 2010	3
<b>Total</b>	<b>15</b>

#### ***SEMESTER 5 (Fall)***

PHYSICS 2020 General Physics	4
PHYSICS 2029 General Physics Lab	1
GEO 3XXX or BIOL** elective	3
GEO 1XXX Elective	3
ED PS 2110 Learning and Literacy	3
TL 5170 Secondary Science Teaching	3
<b>Total</b>	<b>17</b>

#### ***SEMESTER 6 (Spring)***

FCS 5230 or EDPS5050 or	
PSYCH 3220 or <u>PSYCH 1230</u>	3
GEO 4500 Field Methods	3
SPED 5011 Teaching Stud. Disab...	3
ECS 2XXX Intro to Multi-cult. Ed.	3
TL 5141 Ed. Appl. of Technology...	3
<b>Total</b>	<b>15</b>

#### ***SEMESTER 7 (Fall, Cohort year)***

TL 5126 Content Area Literacy Instruction	3
TL 5410 *Curriculum & Assessment...	3
TL 5411 *Instruction & Management...	3
TL 5490 *Field Practicum: Secondary	3
GEO 3XXX or BIOL elective	3
<b>Total</b>	<b>15</b>

#### ***SEMESTER 8 (Spring, Cohort year)***

TL 5695 *Stud. Teaching: Secondary	9
TL 5491 *Action/Res. Seminar Second.	3
<b>Total</b>	<b>12</b>

#### **Total Program Credits**

**123**

#### Notes:

Diversity requirement:	ESC 2XXX
QA requirement:	MATH 1050
QB requirement:	MATH 1070
Upper division English:	GEO 4500
American Institutions:	ECON 1740, or HIST 1700, or POLS 1100, or HONOR 2212
Social and Behavioral Science (BF/BI):	PSYCH 1230 and ECS 4150
Meets Fine Arts (FF/FI)	See Catalogue for options
Meets Science (SF/SI)	Any two: All GEO 1XXX, GEO 3200, 3250-60, 3300, 3800, METO 1010, PHYSICS 1070 PHYSICS 3060, BIOL 1000, BIOL 1020
Meets Humanities (HF/HI)	EDPS 2110, ECS 2XXX

Higher level courses in most cases may be substituted for lower level courses.

\*Must be taken senior year

\*\*The BIOL electives lead to an Integrated Science Elective: Choose BIOL 1000 and BIOL 2210



## Appendix C

### Faculty

#### Program Director

Dr. Barbara P. Nash, 506 WBB, 581-8587, bpnash@mines.utah.edu, Chair of Undergraduate Affairs Committee and ESCT Major Program, Tenured, Responsible for signoff sheets, advising.

#### Advisors

Dr. Erich U. Petersen, 518 WBB, 581-7238, eupeters@mines.utah.edu, Tenured, maintains program webpage in consultation with the Program Director.

Kim Atwater, Academic Specialist, 714 WBB, 581-6553, katwater@mines.utah.edu, staff member, maintains program records, updates candidates tracking sheets, checks graduation requirements, disseminates scheduling changes and other information that might impact the major.

#### Faculty (all in the Department of Geology and Geophysics in the College of Mines and Earth Sciences.

Dr. Paul Jewell, 462 INSCC, 581-6626, pwjewell@mines.utah.edu, Tenured, Hydrology, Teaches GEO 1110, 1111

Dr. Francis H. Brown, Dean, College of Mines & Earth Sciences, 209 WBB, 581-8767, fbrown@mines.utah.edu, Tenured, Paleontology/Petrology, Teaches GEO 1220

Dr. Erich U. Petersen, 518 WBB, 581-7238, eupeters@mines.utah.edu, Tenured, Mineralogy/Natural Resources, Teaches GEO 3080

Dr. John M. Bartley, 610 WBB, 581-1670, jbartley@mines.utah.edu, Tenured, Structure, Teaches GEO 3080, 1000

Dr. John R. Bowman, 521 WBB, 581-7250, jrbowman@mines.utah.edu, Tenured, Metamorphic Petrology/Isotope geology Teaches GEO 3090

Dr. William P. Johnson, 464 INSCC, 581-5033, wjohnson@mines.utah.edu, Tenured, Hydrology, Teaches GEO 3090

Dr. David A. Dinter, 508 WBB, 581-7937, dadinter@mines.utah.edu, Research Associate Professor, Structure, Teaches GEO 4500, 1000

Dr. Richard D. Jarrard, 602 WBB, 585-3964, jarrard@mines.utah.edu, Tenured, Geophysics, Teaches GEO 1001

Dr. David A. Chapman, 310 PARK, 581-7642, dchapman@park.utah.edu, Tenured, Geophysics/Global Change, Teaches GEO 1002

Dr. Scott D. Sampson, 354 GTB, 585-0561, sampson@umnh.utah.edu, Tenured, Paleontology, Teaches GEO 1006

Dr. Tony A. Ekdale, 601 WBB, 581-7266, ekdale@mines.utah.edu, Tenured, Paleontology/Ecology/Biology, Teaches GEO 1008,

Dr. Barbara P. Nash, 506 WBB, 581-8587, bpnash@mines.utah.edu, Tenured, Ingeous Petrology/Hazards, Teaches GEO 3200

Dr. Thure E. Cerling, 206 WBB, 581-5558, tcerling@mines.utah.edu, Tenured, Geochemistry, Teaches GEO 3300

Dr. Ronald R. Bruhn, 612 WBB, 581-6619, rlbruhn@mines.utah.edu, Tenured, Structure/Tectonics, Teaches GEO 3250

Dr. Peter H. Roth, 507 WBB, 581-6704, phroth@mines.utah.edu, Tenured, Paleontology/Oceanography, Teaches GEO 3800

In addition to faculty in the Department of Geology and Geophysics, Faculty from Math, Chemistry, Physics, Biology and the College of Education will support the program.