

Fiscal Unit/Academic Org	School of Earth Sciences - D0656
Administering College/Academic Group	Mathematical And Physical Sci
Co-administering College/Academic Group	Arts And Sciences
Semester Conversion Designation	Re-envisioned with significant changes to program goals and/or curricular requirements (e.g., degree/major name changes, changes in program goals, changes in core requirements, structural changes to tracks/options/courses)
Current Program/Plan Name	Geological Sciences Minor
Proposed Program/Plan Name	Earth Sciences Minor
Program/Plan Code Abbreviation	GEOLSCI-MN
Current Degree Title	

Credit Hour Explanation

Program credit hour requirements		A) Number of credit hours in current program (Quarter credit hours)	B) Calculated result for 2/3rds of current (Semester credit hours)	C) Number of credit hours required for proposed program (Semester credit hours)	D) Change in credit hours
Total minimum credit hours required for completion of program		20	13.3	12	1.3
Required credit hours offered by the unit	Minimum	20	13.3	12	1.3
	Maximum	23	15.3	15	0.3
Required credit hours offered outside of the unit	Minimum	0	0.0	0	0.0
	Maximum	0	0.0	0	0.0
Required prerequisite credit hours not included above	Minimum	5	3.3	4	0.7
	Maximum	10	6.7	8	1.3

Program Learning Goals

Note: these are required for all undergraduate degree programs and majors now, and will be required for all graduate and professional degree programs in 2012. Nonetheless, all programs are encouraged to complete these now.

Program Learning Goals •

Assessment

Assessment plan includes student learning goals, how those goals are evaluated, and how the information collected is used to improve student learning. An assessment plan is required for undergraduate majors and degrees. Graduate and professional degree programs are encouraged to complete this now, but will not be required to do so until 2012.

Is this a degree program (undergraduate, graduate, or professional) or major proposal? No

Program Specializations/Sub-Plans

If you do not specify a program specialization/sub-plan it will be assumed you are submitting this program for all program specializations/sub-plans.

Program Specialization/Sub-Plan Name Economic Geology (Existing)

Program Specialization/Sub-Plan Goals •

Program Specialization/Sub-Plan Name Earth Sciences (New)

Program Specialization/Sub-Plan Goals •

Program Specialization/Sub-Plan Name Paleontology (New)

Program Specialization/Sub-Plan Goals •

- Program Specialization/Sub-Plan Name Mineralogy and Petrology (Existing)
- Program Specialization/Sub-Plan Goals •

- Program Specialization/Sub-Plan Name Geophysics (Existing)
- Program Specialization/Sub-Plan Goals •

- Program Specialization/Sub-Plan Name Geochemistry (Existing)
- Program Specialization/Sub-Plan Goals •

- Program Specialization/Sub-Plan Name Environmental Studies (Existing)
- Program Specialization/Sub-Plan Goals •

- Program Specialization/Sub-Plan Name Geoarcheology (Existing)
- Program Specialization/Sub-Plan Goals •

Pre-Major

Does this Program have a Pre-Major? No

Attachments

- Earth Sciences Minor Semester Proposal Attach2 28 April.doc: Earth Sciences Minor Program Proposal
(Program Proposal. Owner: Krissek, Lawrence Alan)
- Earth Sciences minor cover letter.doc: NMS Division of Arts and Sciences cover letter
(Letter from the College to OAA. Owner: Andereck, Claude David)

Comments

- PACER Credit Hour Explanation table shows lowest minimum values for any subprogram (e.g., Economic Geology subprogram, Mineralogy and Petrology subprogram) and highest maximum values for any subprogram (e.g., Geochemistry subprogram). A separate version of the Credit Hour Explanation table is included with the requirements for each subprogram. *(by Krissek, Lawrence Alan on 04/28/2011 02:46 PM)*

Workflow Information

Status	User(s)	Date/Time	Step
Submitted	Krissek, Lawrence Alan	03/18/2011 05:04 PM	Submitted for Approval
Approved	Krissek, Lawrence Alan	03/18/2011 05:05 PM	Unit Approval
Revision Requested	Andereck, Claude David	03/29/2011 01:29 PM	College Approval
Submitted	Krissek, Lawrence Alan	04/28/2011 02:47 PM	Submitted for Approval
Approved	Krissek, Lawrence Alan	04/28/2011 02:48 PM	Unit Approval
Approved	Andereck, Claude David	04/28/2011 03:42 PM	College Approval
Pending Approval	Nolen, Dawn Jenkins, Mary Ellen Bigler Meyers, Catherine Anne Vankeerbergen, Bernadette Chantal Hanlin, Deborah Kay	04/28/2011 03:42 PM	ASCCAO Approval

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April 28, 2011

Larry Krissek
Chair, Arts and Sciences CCI

Dear Larry:

It is a pleasure to forward to you for consideration by the CCI and the Sciences Subcommittee the proposal for the undergraduate minor in Earth Sciences under semesters. The School of Earth Sciences is requesting that the name of the minor be changed from Geological Sciences to Earth Sciences, and the name of one specialization be changed to better reflect the nature of the subprogram itself and current usage in the field. The most significant change proposed is the addition of two new specializations, one in Earth Sciences and one in Paleontology.

Beyond my own review of the documents, the proposal has been discussed by colleagues from other NMS units at a meeting on March 29, 2011. Feedback from these discussions has been incorporated in the proposal.

If you have any questions, I would be happy to address them.

Sincerely,



David Andereck
Professor of Physics
Associate Dean of Natural and Mathematical Sciences, College of Arts and Sciences

LETTER FROM PROGRAM-OFFERING UNIT

DATE: 5 January 2011 (updated 8 April 2011)

TO: NMS, ASC, and OAA Reviewers

FROM: Lawrence Krissek, Associate Director for Administration, School of Earth Sciences (Acting Director, 23 December 2010 to ~15 January 2011)

on behalf of W. Berry Lyons, Director, School of Earth Sciences

SUBJECT: Conversion of Geological Sciences undergraduate programs (B.S., B.A., and minors) from quarters to semesters

At the undergraduate level, the School of Earth Sciences presently offers a B.S. in Geological Sciences, a B.A. in Geological Sciences, and a minor in Geological Sciences with 6 tracks: Archeology and Anthropology, Economic Geology, Environmental Studies, Geochemistry, Geophysics, and Mineralogy and Petrology. During the conversion to semesters, we request that the names of all our programs be changed from Geological Sciences to Earth Sciences, so that the names of our degree and minor programs match the name of our School. This detail was not included at the time the School of Earth Sciences was established, so the quarter-to-semester conversion provides an opportunity to establish uniformity between the name of our unit and the names of our undergraduate programs.

In addition to changing the names of our undergraduate degrees and minors, the extent of change during the quarter-to-semester conversion ranges from minimal (for the B.A. and the existing minor tracks) to a significant re-envisioning (for the B.S., where 4 tracks are proposed, and for the minor, with the addition of 2 new tracks). The conversion of our graduate programs will be addressed in a separate letter.

The process that developed the conversions proposed here was led by Prof. Larry Krissek, the SES Associate Director for Administration and chair of the SES Curriculum Committee. Because of the importance of this conversion, the process used the entire faculty as a committee-of-the-whole, with additional input from students, alumni, and potential employers of our graduates. Information from benchmark institutions and from a survey of curricular requirements at 150+ Earth Science/Geological Science departments in the U.S. also was used to guide our discussions.

Beginning in Winter 2010, faculty were informed of the developing boundary conditions (particularly the credit hours required for a degree, and the new General Education requirements) for semester-based degree programs and minors at faculty meetings and via e-mail, and were encouraged to think creatively about the form and content of our undergraduate programs under semesters. The primary focus of discussions within SES was the B.S. program, since the B.S. is the degree taken by the vast majority of our students and is the degree that prepares students for careers as professional earth scientists.

As a result of changes within our faculty in the past decade, combined with the establishment of the School of Earth Sciences, the range of topics considered by our faculty and students has broadened significantly beyond the traditional geological sciences. This breadth of content and interests is not reflected in our present B.S. curriculum, so our discussions quickly focused on whether to establish tracks within our B.S. program. After extensive discussions in small groups and at several faculty meetings, the

faculty voted – on 4 March 2010 – to explore the development of tracks within our B.S. program. That vote was 22 in favor, 2 against, and no abstentions.

Ad hoc faculty “working groups” subsequently developed plans for 4 tracks within our B.S. – Geological Sciences, Earth System Science, Geophysics, and Petroleum Geology and Geophysics. The proposals for the first 3 tracks were discussed at several faculty meetings during Spring 2010, and these tracks were approved by a unanimous faculty vote at a faculty meeting on 9 June 2010 (15 yes, 0 no, 0 abstentions). The proposal for the Petroleum Geology and Geophysics track was developed by another ad hoc “working group” during Summer 2010, was discussed extensively by e-mail during August and September 2010, and was approved by a near-unanimous vote at a faculty meeting on 7 October 2010 (21 yes, 1 no, 0 abstentions).

Conversion of our B.A. was discussed at several faculty meetings and by small groups during Spring 2010, with the conclusion that our existing B.A. should be converted with relatively minimal changes. This conversion proposal was approved by unanimous vote at a faculty meeting on 9 June 2010 (15 yes, 0 no, 0 abstentions).

Conversion of our undergraduate minors also was discussed at several faculty meetings and by small groups during Spring 2010. In addition to concluding that the 6 existing tracks should be converted with relatively minimal changes, the faculty also agreed that we should institute 2 additional tracks: 1) a more generalized Earth Sciences track, and 2) a track in Paleontology. The conversion proposal for the 6 existing tracks and the new Earth Sciences track was approved by a near-unanimous vote at a faculty meeting on 9 June 2010 (14 yes, 1 no, 0 abstentions); the proposal for the new track in Paleontology was approved unanimously by e-mail vote in late June (15 yes, 0 no, 0 abstentions). The conversion proposal for the Environmental Studies track subsequently underwent minor revision, and the revised proposal for that track was approved by a near-unanimous vote at a faculty meeting on 7 October 2010 (20 yes, 1 no, 1 abstention). In response to feedback from the NMS Divisional Advisory Panel, the faculty discussed and unanimously approved (22 yes, 0 no, 0 abstentions) changing the name of the Anthropology and Archeology subprogram to Geoarcheology at a faculty meeting on 1 April 2011.

The details of these conversions are included in the appropriate program templates and proposals. Please contact us if you have any questions.

Thank you for your attention to these proposals.

W. Berry Lyons
Professor and Director
School of Earth Sciences

Lawrence Krissek
Professor and Associate Director for Administration
School of Earth Sciences

PROGRAM RATIONALE STATEMENT

The date of the last significant revision of the Geological Sciences (now requested to be Earth Sciences) Minor program was in the 1990s.

The proposed changes to the Minor in Earth Sciences can be categorized overall as a significant re-envisioning, although some existing components of the Minor are changed only minimally in the conversion. The proposed changes include the following items:

- 1) change the name of the Minor, from Geological Sciences to Earth Sciences. This name change is proposed so that the name of the Minor matches the name of our unit; the name change also is appropriate given the fact that our faculty, research areas, course offerings, and student interests have broadened from the traditional Geological Sciences to the more-encompassing Earth Sciences. We are requesting this name change for all degrees (B.S., B.A., minors, and graduate degrees) presently named “Geological Sciences”.

- 2a) establish 8 transcriptable subprograms within the Earth Sciences Minor. Six of these are conversions of existing “tracks” – Archeology and Anthropology (with a name change to Geoarcheology), Economic Geology, Environmental Studies, Geochemistry, Geophysics, and Mineralogy and Petrology. Two of these are new subprograms – a general Earth Sciences subprogram, and Paleontology. The details of each subprogram are discussed separately below. Note that a separate version of the PACER credit-hour-conversion-table is included with the requirements for each subprogram.

- 2b) **Anthropology and Archeology (converted to Geoarcheology) subprogram** – in order to more accurately reflect the content of this subprogram, and to align the name of this subprogram with the present usage of terminology within the earth sciences community, we request that the name of this subprogram be changed to Geoarcheology. Present usage of “Geoarcheology” is described by the “aims and scope” of the international journal *Geoarchaeology* as follows: “ this field lies at the interface between archeology and the geosciences, and includes interdisciplinary work focusing on understanding archeological sites, their environmental context, site formation processes, and how the analysis of sedimentary records can enhance our interpretations of human activity in Quaternary environments. Work in this field examines the interrelationship between archeology and various disciplines within Quaternary science and the Earth Sciences more generally, including geomorphology, pedology, oceanography, geochemistry, geochronology, geophysics, paleontology, and paleoecology.”

The courses contained in this subprogram examine earth materials, earth processes, the fossil record, and techniques for placing paleoenvironmental data into a stratigraphic and temporal context. Archeological applications are not the primary foci of these courses; however, the approaches and techniques considered in these courses can be applied to any paleoenvironmental record, whether in “deep time” or in the more recent past (i.e., the Quaternary). As such, the courses in this subprogram satisfy the aims and scope implied by the title “Geoarcheology”.

The details of converting this subprogram are straightforward; courses in the Preparation for this subprogram and in the required core of this subprogram have converted on a 1-to-1 basis. The requirement to choose one additional course also has converted directly, although two additional courses have been added to the list of choices. These two additional courses consider topics (shallow geophysics and stable isotope biogeochemistry) that have become more important in the field since the last revision of this track.

The required core courses and all options for the electives are at the 4000-level and above, making this a particularly rigorous subprogram.

2c) **Earth Sciences subprogram** – this is a new subprogram, designed to provide an option for students whose interests in Earth Sciences do not lie within the subject area of a more focused subprogram. It is unclear why a more generalized option was never established in the existing Geological Sciences Minor; semester conversion provides an opportunity to establish such a subprogram. This subprogram requires at least 3 credit hours at the 3000-level or above, thereby ensuring a level of academic rigor.

2d) **Economic Geology subprogram** – conversion of this program is relatively straightforward. The Preparation for this subprogram was converted on a 1-to-1 basis. The required core of this subprogram still consists of 3 courses, although 1 of the courses has been changed. Due to faculty retirements, we do not anticipate that the converted version of Earth Sci 660 (i.e., Earth Sci 5660) will be offered regularly in the future; as a result, Earth Sci 660 has been replaced in the required core of this subprogram by Earth Sci 2210, which will be offered regularly.

The requirement to choose at least 1 additional course converts directly, although the list of courses available has changed somewhat. Earth Sci 624 is not being converted to a semester form, so it has been dropped from the list of choices. In order to provide other suitable choices, Earth Sci 5621 (Geochemistry) has been added, and Earth Sci 5660 has been moved from the required core to the list of electives (in case it is offered in the future).

Two of the 3 required core courses, and all options for the electives, are at the 4000-level and above, making this a rigorous subprogram.

2e) **Environmental Studies subprogram** – conversion of this subprogram has broadened student choices in several ways, reflecting broadening in the field of Environmental Studies since this track was last revised. The Preparation for this subprogram still requires 2 courses, but a student now chooses 1 of those courses from a list of 7 options. Five of those 7 courses did not exist when this track was last revised; all 7 of these courses now include a significant component of what is considered “environmental studies”.

The required core of this subprogram has been reduced from 3 courses to 1, primarily to reflect changes in the field and to provide greater student choice. At the time this track was established, geomorphology played a central role in what was considered “environmental studies”, so Earth Sci 550 was a logical inclusion in the required core. The field has broadened considerably since then, however, so Geomorphology (Earth Sci 5550) has been moved into the electives category in the converted subprogram. In addition, much of “environmental studies” in the Geological Sciences focused on groundwater issues at the time this track was established, so Earth Sci 204 was included in the required core. In order to increase student choice within the present-day broader field of “environmental studies”, the converted subprogram allows a student to choose a water-focused course or a more general environmental geosciences course.

The electives requirement has been increased in the conversion, from a minimum of “choose 2” under quarters to a minimum of “choose 3” in semesters; this increase is possible because of the decreased size of the required core. In addition, the converted subprogram requires that the electives include at least 3 credit hours at the 3000-level or above, whereas the electives in the quarter-version

of this subprogram could be completed using only 200-level courses. As a result, the rigor of this subprogram has been improved in the conversion.

The number of courses available in the electives list of the converted subprogram has increased markedly, because the number of environmentally focused courses in Earth Sciences has increased significantly since this track was last revised. These electives will accommodate a broad range of student backgrounds (from relatively non-quantitative to highly quantitative) and a broad range of student interests (from the oceans to glaciers to groundwater to surface water).

- 2f) **Geochemistry subprogram** – this subprogram has been significantly re-envisioned, based on changes in the field of geochemistry and changes in our faculty and course offerings since this track was last revised. The Preparation for this subprogram has been increased from 1 course to 2, with the extra course providing a background in earth history and “deep time”. This additional background is important because several courses now required or elective within this subprogram consider geochemical data, approaches, or conclusions that are employed in the study of earth’s past.

The quarter-version of this subprogram prescribed all courses, with those choices significantly influenced by the faculty and course offerings available at the time this track was first established.

Because our faculty and course offerings in geochemistry have increased and changed in the past decade, the converted subprogram is designed to allow student choice at several levels. The student chooses 1 of 3 courses at the 2000-level; each of these courses provides an introduction to the importance of geochemistry in some portion of the Earth Sciences. The student also chooses 2 courses from a list of options at the 5000-level. The 2 required courses (Earth Sci 4421 and 4423) examine the basic building blocks of earth materials from a strongly geochemical perspective, which provides the foundation for the more-detailed upper-level electives.

Two of the 3 required core courses, and all options for the electives, are at the 4000-level and above, making this a rigorous subprogram.

- 2g) **Geophysics subprogram**-- this subprogram has been significantly re-envisioned, based on changes in the field of geophysics and changes in our faculty and course offerings since this track was last revised. The Preparation for this subprogram has been increased from 1 course to 2, with the extra course helping to illustrate the role of various types of geophysics across the range of the Earth Sciences.

Because geophysical data are now used in most fields in the earth sciences, the requirements for the converted subprogram provide significant opportunities for student choice. At least 3 courses must be chosen from a list of geophysics-focused options at the 4000-level and above; these courses examine geophysical techniques and the applications of geophysical data in detail. To complete this subprogram, the student can choose an additional geophysics-focused course, or can choose a course that more explicitly links geophysics to another aspect of the earth sciences.

At least 9 of the 12 semester credit hours in this subprogram will be chosen from courses at the 4000-level and above, making this a rigorous subprogram.

- 2h) **Mineralogy and Petrology subprogram** – conversion of this subprogram is straightforward; courses in the Preparation for this subprogram and in the required core of this subprogram have converted on

a 1-to-1 basis. The requirement to choose at least 2 additional courses also has converted directly, although the list of choices has changed slightly. These changes primarily reflect changes in course offerings due to faculty retirements.

The required core courses and all options for the electives are at the 4000-level and above, making this a particularly rigorous subprogram.

2i) **Paleontology subprogram** -- this is a new subprogram, designed to provide an option for students with an interest in paleontology. This subprogram takes advantage of the strength of Ohio State's graduate program in paleontology, which is ranked in the top 10 in the U.S. The Preparation for this subprogram is consistent with the Preparation for the other subprograms in the Earth Science Minor; the requirements for this subprogram include a required core course in paleontology, followed by student choice of at least 2 courses from a list of appropriate electives.

The required core course and all options for the electives are at the 4000-level and above, making this a particularly rigorous subprogram.

**LIST OF PROGRAM REQUIREMENTS, SEMESTER COURSES, AND EQUIVALENT
QUARTER COURSES**

And

QUARTER AND SEMESTER ADVISING SHEETS (organized by subprogram)

1) EARTH SCIENCES MINOR – subprogram in Geoaicheology (formerly Anthropology and Archeology; transcriptable)

a) “PACER Table”

Earth Sciences Minor: Geoaicheology Subprogram

Program credit hour requirements		Quarter credit hours in present program	2/3rds of quarter credit hours	Semester credit hours in proposed program	Change in credit hours
Total minimum credit hours to complete program		20	13.3	13	0.3
Required credit hrs. offered by unit	Minimum	20	13.3	13	0.3
	Maximum	20	13.3	13	0.3
Required credit hrs. outside unit	Minimum	0	0	0	0
	Maximum	0	0	0	0
Required prereq. hrs. not included above	Minimum	10	6.7	8	1.3
	Maximum	10	6.7	8	1.3

b) Subprogram Rationale: conversion of this subprogram is straightforward; courses in the Preparation for this subprogram and in the required core of this subprogram have converted on a 1-to-1 basis. The requirement to choose one additional course also has converted directly, although two additional courses have been added to the list of choices. These two additional courses consider topics (shallow geophysics and stable isotope biogeochemistry) that have become more important in the field since the last revision of this track.

SUBPROGRAM REQUIREMENTS:

**COMPARISON OF SUBPROGRAM REQUIREMENTS AND COURSES BETWEEN
QUARTERS AND SEMESTERS**

Earth Sciences Minor: Geoaerchology Subprogram/Track

Qtr. Course Number	Title	Quarter Credit Hours	Semester Course Number	Title	Semester Credit Hours	Prerequisites
Preparation for the minor			Preparation for the minor (Where available, an Honors version can substitute for the equivalent non-Honors course listed below)			
121	The Dynamic Earth	5	1121	The Dynamic Earth	4	Math 1075 or above
122	Earth Through Time	5	1122	Earth Through Time	4	
Minor Program: Complete a minimum of 20 credit hours, as follows:			Minor Program: Complete a minimum of 13 semester credits, as follows:			
a) Complete Earth Sci 421, 423, and 501			a) Complete Earth Sci 4421, 4423, and 4501			
421	Intro. Mineralogy	5	4421	Earth Materials	3	Chem 1210
423	Intro. Petrology	5	4423	Intro. Petrology	3	Earth Sci 1121 and 4421
501	Paleontology	5	4501	Paleontology	4	Earth Sci 1122
b) Complete at least one of Earth Sci 502, 550, and 650:			b) Complete at least one of Earth Sci 4502, 5550, 4560, 5622, and 5650:			
502	Stratigraphy and Sedimentation	5	4502	Stratigraphy and Sedimentation	4	Earth Sci 1121 and 1122
550	Geomorphology	5	5550	Geomorphology	4	Earth Sci 1121 and 1122
650	Glaciology	5	4560	Applied Geophysics	3	Earth Sci 1121; Math 1151; Physics 1250

			5622	Stable Isotope Biogeochemistry	3	Rank 4 or Grad standing in a science
			5650	Glaciology	4	Earth Sci 4450

SUBPROGRAM ADVISING SHEETS: The following 2 pages contain the semester and quarter advising sheets for the Geoaercheology subprogram.

STUDENT NAME: _____ ID _____

EARTH SCIENCES MINOR: GEOARCHEOLOGY SUBPROGRAM

Minor Checklist Semester (Au, Sp, Su) Year Credits Grade

PREPARATION FOR THE MINOR: Complete Earth Sci 1121 and 1122:

EarthSci 1121: _____ _____ 4 _____

EarthSci 1122: _____ _____ 4 _____

Note: Earth Sci 1121H and 1122H can substitute for Earth Sci 1121 and 1122, respectively

MINOR PROGRAM: Complete a minimum of 13 semester credits in Earth Sciences, as follows:

a) Complete Earth Sci 4421, 4423, and 4501:

EarthSci 4421: _____ _____ 3 _____

EarthSci 4423: _____ _____ 3 _____

EarthSci 4501: _____ _____ 4 _____

b) Complete at least one of the following:

EarthSci 4502: _____ _____ 4 _____

EarthSci 5550: _____ _____ 4 _____

EarthSci 4560: _____ _____ 3 _____

EarthSci 5622: _____ _____ 3 _____

EarthSci 5650: _____ _____ 4 _____

STUDENT NAME: _____ ID _____

EARTH SCIENCES MINOR:

ANTHROPOLOGY AND ARCHAEOLOGY TRACK (QUARTERS)

Minor Checklist Quarter (Au, Wi, Sp) Year Credits Grade

PREPARATION FOR THE MINOR:

EarthSci 121: _____ _____ 5 _____

EarthSci 122: _____ _____ 5 _____

Note: Earth Sci 121H and 122H can substitute for Earth Sci 121 and 122, respectively.

MINOR PROGRAM: Complete a minimum of 20 credit hours in Earth Sciences, as follows:

a) Complete Earth Sci 421, 423, and 501:

EarthSci 421: _____ _____ 5 _____

EarthSci 423: _____ _____ 5 _____

EarthSci 501: _____ _____ 5 _____

b) Complete at least one of the following courses:

EarthSci 502: _____ _____ 5 _____

EarthSci 550: _____ _____ 5 _____

EarthSci 650: _____ _____ 5 _____

2) EARTH SCIENCES MINOR – subprogram in Earth Sciences (transcriptable)

a) “PACER Table”

Earth Sciences Minor: Earth Sciences Subprogram (New)

Program credit hour requirements		Quarter credit hours in present program	2/3rds of quarter credit hours	Semester credit hours in proposed program	Change in credit hours
Total minimum credit hours to complete program				12	
Required credit hrs. offered by unit	Minimum			12	
	Maximum			12	
Required credit hrs. outside unit	Minimum			0	
	Maximum			0	
Required prereq. hrs. not included above	Minimum			7	
	Maximum			8	

b) Subprogram Rationale: this is a new subprogram, designed to provide an option for students whose interests in Earth Sciences do not lie within the subject area of a more focused subprogram. It is unclear why a more generalized option was never established in the existing Geological Sciences Minor; semester conversion provides an opportunity to establish such a subprogram. This subprogram requires at least 3 credit hours at the 3000-level or above, thereby ensuring a level of academic rigor.

SUBPROGRAM REQUIREMENTS:

**COMPARISON OF SUBPROGRAM REQUIREMENTS AND COURSES BETWEEN
QUARTERS AND SEMESTERS**

Earth Sciences Minor: Earth Sciences Subprogram/Track – no quarter equivalent

Semester Course Number	Title	Semester Credit Hours	Prerequisites
Preparation for the minor:			
Complete one of (Earth Sci 1100 or 1105 or 1108 or 1110 or 1121 or 1151 or 2155) and Earth Sci 1122			
1100	Planet Earth: How It Works	4	
1105	Geology & the National Parks	3	
1108	Gemstones	3	
1110	History of Life on Earth: Global Change in the Biosphere	3	
1121	The Dynamic Earth	4	Math 1075 or above
1151	Natural Hazards	3	
2155	Energy and Environment	4	
and			
1122	Earth Through Time	4	
Note: (Where available, an Honors version can substitute for the equivalent non-Honors course listed above)			
Minor Program:			
Complete a minimum of 12 semester credit hours in Earth Sciences at the 2000-level and above, with at least 3 credit hours at the 3000-level and above. A maximum of 3 credit hours of internship (x191), research (x998, x999) and/or individual study (x193) can be counted toward the minor.			

SUBPROGRAM ADVISING SHEETS: The following page contains the semester advising sheet for the new Earth Sciences subprogram

3) EARTH SCIENCES MINOR – subprogram in Economic Geology (transcriptable)

a) “PACER Table”

Earth Sciences Minor: Economic Geology Subprogram

Program credit hour requirements		Quarter credit hours in present program	2/3rds of quarter credit hours	Semester credit hours in proposed program	Change in credit hours
Total minimum credit hours to complete program		20	13.3	12	1.3
Required credit hrs. offered by unit	Minimum	20	13.3	12	1.3
	Maximum	20	13.3	12	1.3
Required credit hrs. outside unit	Minimum	0	0	0	0
	Maximum	0	0	0	0
Required prereq. hrs. not included above	Minimum	5	3.3	4	0.7
	Maximum	5	3.3	4	0.7

b) Subprogram Rationale: conversion of this program is relatively straightforward. The Preparation for this subprogram has converted on a 1-to-1 basis. The required core of this subprogram still consists of 3 courses, although 1 of the courses has been changed. Due to faculty retirements, we do not anticipate that the converted version of Earth Sci 660 (i.e., Earth Sci 5660) will be offered regularly in the future; as a result, Earth Sci 660 has been replaced in the required core of this subprogram by Earth Sci 2210, which will be offered regularly.

The requirement to choose at least 1 additional course converts directly, although the list of courses available has changed somewhat. Earth Sci 624 is not being converted to a semester form, so it has been dropped from the list of choices. In order to provide other suitable choices, Earth Sci 5621 (Geochemistry) has been added, and Earth Sci 5660 has been moved from the required core to the list of electives (in case it is offered in the future).

Two of the 3 required core courses, and all options for the electives, are at the 4000-level and above, making this a rigorous subprogram.

SUBPROGRAM REQUIREMENTS:

**COMPARISON OF SUBPROGRAM REQUIREMENTS AND COURSES BETWEEN
QUARTERS AND SEMESTERS**

Earth Sciences Minor: Economic Geology Subprogram/Track

Qtr. Course Number	Title	Quarter Credit Hours	Semester Course Number	Title	Semester Credit Hours	Prerequisites
Preparation for the minor			Preparation for the minor			
121	The Dynamic Earth	5	1121	The Dynamic Earth	4	Math 1075 or above
			(Earth Sci 1121H can substitute for Earth Sci 1121)			
Minor Program: Minimum of 20 credit hours, as follows:			Minor Program: Minimum of 12 semester credit hours, as follows:			
a) Complete the following 3 courses:			a) Complete the following 3 courses:			
			2210	Energy, Mineral Resources, and Society	3	
421	Intro. Mineralogy	5	4421	Earth Materials	3	Chem 1210
423	Intro. Petrology	5	4423	Intro. Petrology	3	Earth Sci 1121 and 4421
660	Geology of Metallic Deposits	5				
b) Complete one or both of the following, as needed to complete 20 credit hours:			b) Complete one or more of the following, as needed to complete at least 12 semester credit hours:			
			5621	Introduction to Geochemistry	3	Sr standing in Earth Sci or related fields; Chem 1220 or above; or permission of instructor
624	Microscopy of Opaque Minerals	3				

			5660	Geology of Metallic Deposits	4	Earth Sci 4423
670	Regional and Economic Geology of Selected Areas	3 or 5	5670	Regional and Economic Geology of Selected Areas	2 to 4	Earth Sci 4502, Earth Sci 4530, and Earth Sci 4550; or permission of instructor

SUBPROGRAM ADVISING SHEETS: The following 2 pages contain the semester and quarter advising sheets for the Economic Geology subprogram.

STUDENT NAME: _____ ID _____

EARTH SCIENCES MINOR: ECONOMIC GEOLOGY SUBPROGRAM

Minor Checklist Semester (Au, Sp, Su) Year Credits Grade

PREPARATION FOR THE MINOR:

EarthSci 1121: _____ 4 _____
(Earth Sci 1121H can substitute for Earth Sci 1121)

MINOR PROGRAM: Complete a minimum of 12 semester credit hours in Earth Sciences, as follows:

a) Complete the following 3 courses:

EarthSci 2210: _____ 3 _____

EarthSci 4421: _____ 3 _____

EarthSci 4423: _____ 3 _____

b) complete one or more of the following, as needed to complete at least 12 semester credit hours:

EarthSci 5621: _____ 3 _____

EarthSci 5660: _____ 4 _____

EarthSci 5670: _____ 2 or 4 _____

STUDENT NAME: _____ ID _____

EARTH SCIENCES MINOR:
ECONOMIC GEOLOGY TRACK (QUARTERS)

Minor Checklist Qtr (Au, Wi, Sp) Year Credits Grade

PREPARATION FOR THE MINOR:

EarthSci 121: _____ 5 _____

(Earth Sci 121H can substitute for Earth Sci 121)

MINOR PROGRAM: Complete a minimum of 20 credit hours in Earth Sciences, as follows:

a) Complete Earth Sci 421, 423, and 660:

EarthSci 421: _____ 5 _____

EarthSci 423: _____ 5 _____

EarthSci 660: _____ 5 _____

b) Complete one or more of the following, as needed to complete at least 20 credit hours:

EarthSci 624: _____ 3 _____

EarthSci 670: _____ 3 or 5 _____

4) EARTH SCIENCES MINOR – subprogram in Environmental Studies (transcriptable)

a) “PACER Table”

Earth Sciences Minor: Environmental Studies Subprogram

Program credit hour requirements		Quarter credit hours in present program	2/3rds of quarter credit hours	Semester credit hours in proposed program	Change in credit hours
Total minimum credit hours to complete program		23	15.3	12	3.3
Required credit hrs. offered by unit	Minimum	23	15.3	12	3.3
	Maximum	23	15.3	12	3.3
Required credit hrs. outside unit	Minimum	0	0	0	0
	Maximum	0	0	0	0
Required prereq. hrs. not included above	Minimum	10	6.7	7	0.3
	Maximum	10	6.7	8	1.3

Explanation: Minimum semester credit hours required for this subprogram have been reduced to 12, in order to be more consistent with the requirements in other subprograms in the Earth Sciences Minor. However, more electives have been added at the 4000-level and above, and a requirement has been added for at least 3 credit hours at the 3000-level and above. This requirement for at least 1 upper-level elective increases the academic rigor of this subprogram.

b) Subprogram Rationale: conversion of this subprogram has broadened student choices in several ways, reflecting broadening in the field of Environmental Studies since this track was last revised. The Preparation for this subprogram still requires 2 courses, but a student now chooses 1 of those courses from a list of 7 options. Five of those 7 courses did not exist when this track was last revised; all 7 of these courses now include a significant component of what is considered “environmental studies”.

The required core of this subprogram has been reduced from 3 courses to 1, primarily to reflect changes in the field and to provide greater student choice. At the time this track was established, geomorphology played a central role in what was considered “environmental studies”, so Earth Sci 550 was a logical inclusion in the required core. The field has broadened considerably since then, however, so Geomorphology (Earth Sci 5550) has been moved into the electives category in the converted subprogram. In addition, much of “environmental studies” in the Geological Sciences

focused on groundwater issues at the time this track was established, so Earth Sci 204 was included in the required core. In order to increase student choice within the present-day broader field of “environmental studies”, the converted subprogram allows a student to choose a water-focused course or a more general environmental geosciences course.

The electives requirement has been increased in the conversion, from a minimum of “choose 2” under quarters to a minimum of “choose 3” in semesters; this increase is possible because of the decreased size of the required core. In addition, the converted subprogram requires that the electives include at least 3 credit hours at the 3000-level or above, whereas the electives in the quarter-version of this subprogram could be completed using only 200-level courses. As a result, the rigor of this subprogram has been improved in the conversion.

The number of courses available in the electives list of the converted subprogram has increased markedly, because the number of environmentally focused courses in Earth Sciences has increased significantly since this track was last revised. These electives will accommodate a broad range of student backgrounds (from relatively non-quantitative to highly quantitative) and a broad range of student interests (from the oceans to glaciers to groundwater to surface water).

SUBPROGRAM REQUIREMENTS:

**COMPARISON OF SUBPROGRAM REQUIREMENTS AND COURSES BETWEEN
QUARTERS AND SEMESTERS**

Earth Sciences Minor: Environmental Studies Subprogram/Track

Qtr. Course Number	Title	Quarter Credit Hours	Semester Course Number	Title	Semester Credit Hours	Prerequisites
Preparation for the minor: Complete Earth Sci 121 and 122			Preparation for the minor: Complete one course from (a), and Earth Sci 1122			
121	The Dynamic Earth	5	a) 1100 or 1105 or 1108 or 1110 or 1121 or 1151 or 2155	Planet Earth or Geology of the National Parks or Gemstones or Life on Earth or The Dynamic Earth or Natural Hazards or Energy and Environment	3 or 4	
122	Earth through Time	5	1122	Earth through Time	4	
			(Where available, an Honors course can substitute for the equivalent non-Honors course listed above)			

Minor Program: Minimum of 23 credit hours, as follows:			Minor Program: Minimum of 12 semester credit hours, as follows:			
a) Complete the following 3 courses:			a) Complete one of the following 2 courses:			
203	Environmental Geoscience	5	2203	Environmental Geoscience	3	
204	Exploring Water Issues	5	2204	Exploring Water Issues	3	
550	Geomorphology	5				
b) Complete at least 8 credit hours from the following courses:			b) Complete 9 or more semester credit hours, chosen from the following list of courses. At least 3 credit hours must be at the 3000-level or above:			
			2203 or 2204 (whichever is not used to satisfy Requirement "a" above)	Environmental Geoscience or Exploring Water Issues	3	
206	Principles of Oceanography	5	2206	Principles of Oceanography	3	
210	Energy, Mineral Resources, and Society	5	2210	Energy, Mineral Resources, and Society	3	
212	Introduction to Earth Materials	3	2212	Introduction to Earth Materials	4	
			4450	Water, Ice and Energy in the Earth System	3	Earth Sci 1100 or 1121, or Geog 3901 or 3900 or 5900, or permission of instructor
			5206	Advanced Oceanography	3	Earth Sci 1100 or 1121 or 1105 or permission of instructor
			5550	Geomorphology	4	Earth Sci 1121 and 1122, or permission of instructor

583.xx	Field Geology for Educators	3	4189.xx	Field Geology for Educators	2	Earth Sci 1100 or equivalent, and permission of instructor
621	Principles of Geochemistry	3	5621	Introduction to Geochemistry	3	Sr standing in Earth Sci or related fields and Chem 1220; or permission of instructor
			5622	Stable Isotope Biogeochemistry	3	Sr standing in any science or permission of instructor
			5627	Global Biogeochemical Cycles	3	Earth Sci 5621 or permission of instructor
			5628	Environmental Isotope Geochemistry	3	Earth Sci 5621 or permission of instructor
650	Glaciology	5	5650	Glaciology	4	Earth Sci 4450 or permission of instructor
651	Hydrogeology	5	5651	Hydrogeology	4	Earth Sci 1121 and Math 1152; or permission of instructor
652	Hydrogeology Field Methods	5				
			5663	Global Change and Sustainability in the Earth System	4	Sr standing in Earth Sci, or permission of instructor
			5717	Critical Issues in World	4	Earth Sci 5651

		Freshwater Resources		
	5751	Quantitative Groundwater Flow Modeling	4	Earth Sci 5651
	5752	Contaminants in Aqueous Systems	4	Earth Sci 5651
	5754	Risk Assessment and Management in Earth Systems	4	Earth Sci 5651 or permission of instructor

SUBPROGRAM ADVISING SHEETS: The following 3 pages contain the semester and quarter advising sheets for the Environmental Studies subprogram.

STUDENT NAME: _____ ID _____

EARTH SCIENCES MINOR: ENVIRONMENTAL STUDIES SUBPROGRAM

Minor Checklist	Semester (Au, Sp, Su)	Year	Credits	Grade
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PREPARATION FOR THE MINOR -- Complete one of:

EarthSci 1100:	_____	_____	4	_____
EarthSci 1105:	_____	_____	3	_____
EarthSci 1108:	_____	_____	3	_____
EarthSci 1110:	_____	_____	3	_____
EarthSci 1121:	_____	_____	4	_____
EarthSci 1151:	_____	_____	3	_____
EarthSci 2155:	_____	_____	4	_____

and:

EarthSci 1122:	_____	_____	4	_____
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(Where available, an Honors version of a course listed above can substitute for its non-Honors version.)

MINOR PROGRAM:

a) Complete either Earth Sci 2203 or Earth Sci 2204 (circle course completed):

EarthSci 2203 or 2204:	_____	_____	3	_____
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b) Complete a minimum of 9 semester credit hours from the courses listed below. At least 3 credit hours must be at the 3000-level or above.

EarthSci 2203 or 2204:	_____	_____	3	_____
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(whichever was not used to meet requirement "a" above)

EarthSci 2206:	_____	_____	3	_____
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EarthSci 2210:	_____	_____	3	_____
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EarthSci 2212:	_____	_____	4	_____
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EarthSci 4450:	_____	_____	3	_____
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EarthSci 5206:	_____	_____	3	_____
EarthSci 5550:	_____	_____	4	_____
EarthSci 4189.xx:	_____	_____	2	_____
EarthSci 5621:	_____	_____	3	_____
EarthSci 5622:	_____	_____	3	_____
EarthSci 5627:	_____	_____	3	_____
EarthSci 5628:	_____	_____	3	_____
EarthSci 5650:	_____	_____	4	_____
EarthSci 5651:	_____	_____	4	_____
EarthSci 5663:	_____	_____	4	_____
EarthSci 5717:	_____	_____	4	_____
EarthSci 5751:	_____	_____	4	_____
EarthSci 5752:	_____	_____	4	_____
EarthSci 5754:	_____	_____	4	_____

STUDENT NAME: _____ ID _____

**EARTH SCIENCES MINOR:
ENVIRONMENTAL STUDIES TRACK (QUARTERS)**

Minor Checklist Qtr (Au, Wi, Sp) Year Credits Grade

PREPARATION FOR THE MINOR -- Complete Earth Sci 121 and 122:

EarthSci 121: _____ 5 _____

EarthSci 122: _____ 5 _____

(Earth Sci 121H and 122H can substitute for Earth Sci 121 and 122, respectively.)

MINOR PROGRAM: Complete a minimum of 23 credit hours in Earth Sciences, as follows:

a) Complete Earth Sci 203, 204, and 550:

EarthSci 203: _____ 5 _____

EarthSci 204: _____ 5 _____

EarthSci 550: _____ 5 _____

b) Complete a minimum of 8 credit hours from the courses listed below:

EarthSci 206: _____ 5 _____

EarthSci 210: _____ 5 _____

EarthSci 212: _____ 3 _____

EarthSci 583.xx: _____ 3 _____

EarthSci 621: _____ 5 _____

EarthSci 650: _____ 5 _____

EarthSci 651: _____ 5 _____

EarthSci 652: _____ 5 _____

5) EARTH SCIENCES MINOR – subprogram in Geochemistry (transcriptable)

a) “PACER Table”

Earth Sciences Minor: Geochemistry Subprogram

Program credit hour requirements		Quarter credit hours in present program	2/3rds of quarter credit hours	Semester credit hours in proposed program	Change in credit hours
Total minimum credit hours to complete program		23	15.3	15	0.3
Required credit hrs. offered by unit	Minimum	23	15.3	15	0.3
	Maximum	23	15.3	15	0.3
Required credit hrs. outside unit	Minimum	0	0	0	0
	Maximum	0	0	0	0
Required prereq. hrs. not included above	Minimum	5	3.3	8	4.7
	Maximum	5	3.3	8	4.7

Explanation: Earth Sci 1122 (Earth through Time) has been added as a prerequisite, because the types of geochemistry included in this minor have been increased. Some of those aspects of geochemistry are employed in the study of earth’s past, so a background in earth history and “deep time” is essential to understanding these geochemical applications.

b) Subprogram Rationale: this subprogram has been significantly re-envisioned, based on changes in the field of geochemistry and changes in our faculty and course offerings since this track was last revised. The Preparation for this subprogram has been increased from 1 course to 2, with the extra course providing a background in earth history and “deep time”. This background is important because several courses now required or elective within this subprogram consider geochemical data, approaches, or conclusions that are employed in the study of earth’s past.

The quarter-version of this subprogram prescribed all courses, with those choices significantly influenced by the faculty and course offerings available at the time this track was first established.

Because our faculty and course offerings in geochemistry have increased and changed in the past decade, the converted subprogram is designed to allow student choice at several levels. The student chooses 1 of 3 courses at the 2000-level; each of these courses provides an introduction to the importance of geochemistry in some portion of the Earth Sciences. The student also chooses 2 courses from a list of options at the 5000-level. The 2 required courses (Earth Sci 4421 and 4423)

examine the basic building blocks of earth materials from a strongly geochemical perspective, which provides the foundation for the more-detailed upper-level electives.

Two of the 3 required core courses, and all options for the electives, are at the 4000-level and above, making this a rigorous subprogram.

SUBPROGRAM REQUIREMENTS:

**COMPARISON OF SUBPROGRAM REQUIREMENTS AND COURSES BETWEEN
QUARTERS AND SEMESTERS**

Earth Sciences Minor: Geochemistry Subprogram/Track

Qtr. Course Number	Title	Quarter Credit Hours	Semester Course Number	Title	Semester Credit Hours	Prerequisites
Preparation for the minor			Preparation for the minor: Complete Earth Sci 1121 and 1122			
121	The Dynamic Earth	5	1121	The Dynamic Earth	4	Math 1075 or above
			1122	Earth through Time	4	
			(Honors versions can substitute for 1121 and 1122)			
Minor Program (23 credit hrs): Complete the following 5 courses:			Minor Program: Minimum of 15 semester credit hours, as follows:			
			a) Complete 1 of the following 3 courses:			
204	Exploring Water Issues	5	2203	Environmental Geoscience	3	
212	Intro. to Earth Materials	3	2204	Exploring Water Issues	3	
550	Geomorphology	5	2206	Principles of Oceanography	3	
620	Principles of Isotope Geology	5	b) Complete Earth Sci 4421 and 4423			
621	Principles of Geochemistry	5				
			4421	Earth Materials	3	Chem 1210
			4423	Introductory Petrology	3	Earth Sci 1121 and Earth Sci 4423

	c) Complete 2 courses from the following list:			
	5621	Intro to Geochemistry	3	Sr standing in Earth Sci or related fields; Chem 1220; or permission of instructor
	5622	Stable Isotope Geochemistry	3	Sr standing in science program or permission of instructor
	5627	Global Biogeochemical Cycles	3	Earth Sci 5621 or permission of instructor
	5628	Environmental Isotope Geochemistry	3	Earth Sci 5621 or permission of instructor

SUBPROGRAM ADVISING SHEETS: The following 2 pages contain the semester and quarter advising sheets for the Geochemistry subprogram.

STUDENT NAME: _____ ID _____

EARTH SCIENCES MINOR: GEOCHEMISTRY SUBPROGRAM

Minor Checklist	Semester (Au, Sp, Su)	Year	Credits	Grade
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PREPARATION FOR THE MINOR:

EarthSci 1121:	_____	_____	4	_____
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EarthSci 1122:	_____	_____	4	_____
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(Honors versions can substitute for Earth Sci 1121 and 1122)

MINOR PROGRAM: Complete a minimum of 15 semester credit hours in Earth Sciences, as follows:

a) Complete one of the following courses:

EarthSci 2203:	_____	_____	3	_____
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EarthSci 2204:	_____	_____	3	_____
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EarthSci 2206:	_____	_____	3	_____
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b) Complete Earth Sci 4421 and 4423:

EarthSci 4421:	_____	_____	3	_____
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EarthSci 4423:	_____	_____	3	_____
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c) Complete 2 of the following courses:

EarthSci 5621:	_____	_____	3	_____
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EarthSci 5622:	_____	_____	3	_____
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EarthSci 5627:	_____	_____	3	_____
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EarthSci 5628:	_____	_____	3	_____
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STUDENT NAME: _____ ID _____

EARTH SCIENCES MINOR: GEOCHEMISTRY TRACK (QUARTERS)

Minor Checklist **Qtr (Au, Wi, Sp)** **Year** **Credits** **Grade**

PREPARATION FOR THE MINOR:

EarthSci 121: _____ _____ 5 _____

(Earth Sci 121H can substitute for Earth Sci 121)

MINOR PROGRAM: Complete the following courses (23 credit hours in Earth Sciences):

EarthSci 204: _____ _____ 5 _____

EarthSci 212: _____ _____ 3 _____

EarthSci 550: _____ _____ 5 _____

EarthSci 620: _____ _____ 5 _____

EarthSci 621: _____ _____ 5 _____

6) EARTH SCIENCES MINOR – subprogram in Geophysics (transcriptable)

a) “PACER Table”

Earth Sciences Minor: Geophysics Subprogram

Program credit hour requirements		Quarter credit hours in present program	2/3rds of quarter credit hours	Semester credit hours in proposed program	Change in credit hours
Total minimum credit hours to complete program		23	15.3	12	3.3
Required credit hrs. offered by unit	Minimum	23	15.3	12	3.3
	Maximum	23	15.3	12	3.3
Required credit hrs. outside unit	Minimum	0	0	0	0
	Maximum	0	0	0	0
Required prereq. hrs. not included above	Minimum	5	3.3	7	3.7
	Maximum	5	3.3	8	4.7

Explanation: An additional prerequisite course has been added, in order to illustrate the role of various types of geophysics across the range of the Earth Sciences. The minimum credit hour requirement has been reduced to 12, to be consistent with the requirements of most subprograms in the Earth Sciences Minor. The rigor of this subprogram has been maintained, however, by requiring at least 3 courses at the 4000-level and above.

b) Subprogram Rationale: this subprogram has been significantly re-envisioned, based on changes in the field of geophysics and changes in our faculty and course offerings since this track was last revised. The Preparation for this subprogram has been increased from 1 course to 2, with the extra course helping to illustrate the role of various types of geophysics across the range of the Earth Sciences.

Because geophysical data are now used in most fields in the earth sciences, the requirements for the converted subprogram provide significant opportunities for student choice. At least 3 courses must be chosen from a list of geophysics-focused options at the 4000-level and above; these courses examine geophysical techniques and the applications of geophysical data in detail. To complete this subprogram, the student can choose an additional geophysics-focused course, or can choose a course that more explicitly links geophysics to another aspect of the earth sciences.

At least 9 of the 12 semester credit hours in this subprogram will be chosen from courses at the 4000-level and above, making this a rigorous subprogram.

SUBPROGRAM REQUIREMENTS:

**COMPARISON OF SUBPROGRAM REQUIREMENTS AND COURSES BETWEEN
QUARTERS AND SEMESTERS**

Earth Sciences Minor: Geophysics Subprogram/Track

Qtr. Course Number	Title	Quarter Credit Hours	Semester Course Number	Title	Semester Credit Hours	Prerequisites
Preparation for the minor			Preparation for the minor: Complete 2 of the following courses:			
121	The Dynamic Earth	5	1121	The Dynamic Earth	4	Math 1075 or above
			1122	Earth through Time	4	
			1151	Natural Hazards	3	
			2155	Energy and Environment	4	
			(Honors versions can substitute for 1121 and 1122)			
Minor Program (23 credit hrs): Minimum of 23 credit hours, as follows:			Minor Program: Minimum of 12 semester credit hours in Earth Sciences at the 2000-level and above, with at least 9 credit hours chosen from the following:			
			4310	Remote Sensing in the Earth Sciences	3	Earth Sci 1121, Math 1151, Physics 1250
			a) Complete the following 4 courses:			4421
212	Intro. to Earth Materials	3	4423	Intro Petrology	3	Earth Sci 1121 and Earth Sci 4421
530	Structural Geology	5	4560	Applied Geophysics	3	Earth Sci 1121, Math 1151,

						Physics 1250
560	Intro Geophysics	5	5680	Deep Earth Geophysics	3	Math 1152, Physics 1251
680	Advanced Geophysics	5	5687	Energy Geophysics	3	Earth Sci 1121, Math 1151, Physics 1250
b) Complete at least 5 credit hours from the following courses:			5780	Reflection Seismology	4	Earth Sci 1121, Math 1151, Physics 1250
646	Geodynamics	5				
686	Environmental Geophysics	5				
687	Exploration Geophysics	5				

SUBPROGRAM ADVISING SHEETS: The following 2 pages contain the semester and quarter advising sheets for the Geophysics subprogram.

STUDENT NAME: _____ ID _____

EARTH SCIENCES MINOR: GEOPHYSICS SUBPROGRAM

Minor Checklist Semester (Au, Sp, Su) Year Credits Grade

PREPARATION FOR THE MINOR: Complete 2 of the following 4 courses:

EarthSci 1121:	_____	_____	4	_____
EarthSci 1122:	_____	_____	4	_____
EarthSci 1151:	_____	_____	3	_____
EarthSci 2155:	_____	_____	3	_____

(Honors versions can substitute for Earth Sci 1121 and 1122)

MINOR PROGRAM: Complete a minimum of 12 semester credit hours in Earth Sciences at the 2000-level and above, with at least 9 credit hours chosen from the following courses:

EarthSci 4310:	_____	_____	3	_____
EarthSci 4421:	_____	_____	3	_____
EarthSci 4423:	_____	_____	3	_____
EarthSci 4560:	_____	_____	3	_____
EarthSci 5680:	_____	_____	3	_____
EarthSci 5687:	_____	_____	3	_____
EarthSci 5780:	_____	_____	4	_____

STUDENT NAME: _____ ID _____

EARTH SCIENCES MINOR: GEOPHYSICS TRACK (QUARTERS)

Minor Checklist **Qtr (Au, Sp, Su)** **Year** **Credits** **Grade**

PREPARATION FOR THE MINOR: Complete Earth Sci 121:

EarthSci 121: 5

(Earth Sci 121H can substitute for Earth Sci 121)

MINOR PROGRAM: Complete a minimum of 23 credit hours in Earth Sciences, as follows:

a) Complete Earth Sci 212, 530, 560, and 680:

EarthSci 212: 3

EarthSci 530: 5

EarthSci 560: 5

EarthSci 680: 5

b) Complete at least 5 credit hours in Earth Sciences, chosen from the following courses:

EarthSci 646: 5

EarthSci 686: 5

EarthSci 687: 5

7) EARTH SCIENCES MINOR – subprogram in Mineralogy and Petrology (transcriptable)

a) “PACER Table”

Earth Sciences Minor: Mineralogy and Petrology Subprogram

Program credit hour requirements		Quarter credit hours in present program	2/3rds of quarter credit hours	Semester credit hours in proposed program	Change in credit hours
Total minimum credit hours to complete program		20	13.3	12	1.3
Required credit hrs. offered by unit	Minimum	20	13.3	12	1.3
	Maximum	20	13.3	12	1.3
Required credit hrs. outside unit	Minimum	0	0	0	0
	Maximum	0	0	0	0
Required prereq. hrs. not included above	Minimum	5	3.3	4	0.7
	Maximum	5	3.3	4	0.7

b) Subprogram Rationale: conversion of this subprogram is straightforward; courses in the Preparation for this subprogram and in the required core of this subprogram have converted on a 1-to-1 basis. The requirement to choose at least 2 additional courses also has converted directly, although the list of choices has changed slightly. These changes primarily reflect changes in course offerings due to faculty retirements.

The required core courses and all options for the electives are at the 4000-level and above, making this a particularly rigorous subprogram.

SUBPROGRAM REQUIREMENTS:

**COMPARISON OF SUBPROGRAM REQUIREMENTS AND COURSES BETWEEN
QUARTERS AND SEMESTERS**

Earth Sciences Minor: Mineralogy and Petrology Subprogram/Track

Qtr. Course Number	Title	Quarter Credit Hours	Semester Course Number	Title	Semester Credit Hours	Prerequisites
Preparation for the minor			Preparation for the minor			
121	The Dynamic Earth	5	1121	The Dynamic Earth	4	Math 1075 or above
			(Earth Sci 1121H can substitute for Earth Sci 1121)			
Minor Program: Minimum of 20 credit hours, as follows:			Minor Program: Minimum of 12 semester credit hours, as follows:			
a) Complete the following 2 courses:			a) Complete the following 2 courses:			
421	Intro. Mineralogy	5	4421	Earth Materials	3	Chem 1210
423	Intro. Petrology	5	4423	Intro. Petrology	3	Earth Sci 1121 and 4421
b) Complete a minimum of 10 credit hours from the following list of courses:			b) Complete a minimum of 6 semester credit hours from the following list of courses:			
601.01	Sedimentary Petrology of Sandstones	5	5601.01	Sedimentary Petrology: Sandstones	4	Earth Sci 4502 or permission of instructor
601.02	Sedimentary Petrology of Carbonates and Shales	5	5601.02	Sedimentary Petrology: Carbonates and Shales	4	Earth Sci 4502 or permission of instructor
617	Petrology of Earth and Planets	5	5617	Petrology of Earth and Planets	4	Earth Sci 4423
625	Igneous Petrology	5	5621	Intro Geochemistry	3	Sr standing in Earth Sci or related field; Chem 1220; or

						permission of instructor
635	Advanced Crystallography	4	5625	Igneous Petrology	4	Earth Sci 4423
636	Advanced Mineralogy	4	5636	Advanced Topics in Mineralogy and Crystallography	3	Earth Sci 4421 or permission of instructor
637	X-Ray Diffraction	3				

SUBPROGRAM ADVISING SHEETS: The following 2 pages contain the semester and quarter advising sheets for the Mineralogy and Petrology subprogram.

STUDENT NAME: _____ ID _____

EARTH SCIENCES MINOR: MINERALOGY AND PETROLOGY SUBPROGRAM

Minor Checklist Semester (Au, Sp, Su) Year Credits Grade

PREPARATION FOR THE MINOR:

EarthSci 1121: _____ _____ 4 _____
(Earth Sci 1121H can substitute for Earth Sci 1121)

MINOR PROGRAM: Complete a minimum of 12 semester credit hours in Earth Sciences, as follows:

a) Complete Earth Sci 4421 and 4423:

EarthSci 4421: _____ _____ 3 _____

EarthSci 4423: _____ _____ 3 _____

b) Complete a minimum of 6 semester credit hours from the following list of courses:

EarthSci 5601.01: _____ _____ 4 _____

EarthSci 5601.02: _____ _____ 4 _____

EarthSci 5617: _____ _____ 4 _____

EarthSci 5621: _____ _____ 3 _____

EarthSci 5625: _____ _____ 4 _____

EarthSci 5636: _____ _____ 3 _____

STUDENT NAME: _____ ID _____

EARTH SCIENCES MINOR:

MINERALOGY AND PETROLOGY TRACK (QUARTERS)

Minor Checklist Qtr. (Au, Wi, Sp) Year Credits Grade

PREPARATION FOR THE MINOR:

EarthSci 121: _____ _____ 5 _____
(Earth Sci 121H can substitute for Earth Sci 121)

MINOR PROGRAM: Complete a minimum of 20 credit hours in Earth Sciences, as follows:

a) Complete Earth Sci 421 and 423:

EarthSci 421: _____ _____ 5 _____

EarthSci 423: _____ _____ 5 _____

b) Complete a minimum of 10 credit hours from the following list of courses:

EarthSci 601.01: _____ _____ 5 _____

EarthSci 601.02: _____ _____ 5 _____

EarthSci 617: _____ _____ 5 _____

EarthSci 625: _____ _____ 5 _____

EarthSci 635: _____ _____ 4 _____

EarthSci 636: _____ _____ 4 _____

EarthSci 637: _____ _____ 3 _____

8) EARTH SCIENCES MINOR – subprogram in Paleontology (transcriptable)

a) “PACER Table”

Earth Sciences Minor: Paleontology Subprogram (New)

Program credit hour requirements		Quarter credit hours in present program	2/3rds of quarter credit hours	Semester credit hours in proposed program	Change in credit hours
Total minimum credit hours to complete program				12	
Required credit hrs. offered by unit	Minimum			12	
	Maximum			12	
Required credit hrs. outside unit	Minimum			0	
	Maximum			0	
Required prereq. hrs. not included above	Minimum			7	
	Maximum			8	

b) Subprogram Rationale: -- this is a new subprogram, designed to provide an option for students with an interest in paleontology. This subprogram takes advantage of the strength of Ohio State’s program in paleontology, which is ranked in the top 10 in the U.S. The Preparation for this subprogram is consistent with the Preparation for the other subprograms in the Earth Science Minor; the requirements for this subprogram include a required core course in paleontology, followed by student choice of at least 2 courses from a list of appropriate electives.

The required core course and all options for the electives are at the 4000-level and above, making this a particularly rigorous subprogram.

SUBPROGRAM REQUIREMENTS:**COMPARISON OF SUBPROGRAM REQUIREMENTS AND COURSES BETWEEN
QUARTERS AND SEMESTERS**

Earth Sciences Minor: Paleontology Subprogram/Track – no quarter equivalent

Semester Course Number	Title	Semester Credit Hours	Prerequisites
Preparation for the minor: Complete 1 course from Category a), and Earth Sci 1122.			
a) 1100 or 1105 or 1108 or 1121 or 1151 or 2155	Planet Earth or Geology of the National Parks or Gemstones or The Dynamic Earth or Natural Hazards or Energy and Environment	3 or 4	
1122	Earth through Time	4	
(Where available, an Honors version can substitute for the equivalent non-Honors course listed above)			
Minor Program: Minimum of 12 semester credit hours, as follows:			
a) Complete Earth Sci 4501:			
4501	Paleontology	4	Earth Sci 1122 and 3 cr hrs in Biological Sciences
b) Complete a minimum of 8 semester credit hours, chosen from the following courses:			
4502	Stratigraphy and Sedimentation	4	Earth Sci 1121 and Earth Sci 1122
5602.01	Carbonate Depositional Systems I	2	Earth Sci 4502
5602.02	Carbonate Depositional Systems II	2	Earth Sci 5602.01
5613	Micropaleontology	4	Earth Sci 4501
5614	Paleobiology	4	Earth Sci 4501
5615	Paleoecology	4	Earth Sci 5614
5621	Introduction to Geochemistry	3	Sr standing in Earth Sci or related fields; Chem 1220; or permission of

			instructor
5206	Advanced Oceanography	3	Earth Sci 1100 or 1121 or 1105 or permission of instructor

SUBPROGRAM ADVISING SHEETS: The following 1 page contains the semester advising sheet for the Paleontology subprogram.

STUDENT NAME: _____ ID _____

EARTH SCIENCES MINOR: PALEONTOLOGY SUBPROGRAM

Minor Checklist	Semester (Au, Sp, Su)	Year	Credits	Grade
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PREPARATION FOR THE MINOR -- Complete one of:

EarthSci 1100:	_____	_____	4	_____
EarthSci 1105:	_____	_____	3	_____
EarthSci 1108:	_____	_____	3	_____
EarthSci 1110:	_____	_____	3	_____
EarthSci 1121:	_____	_____	4	_____
EarthSci 1151:	_____	_____	3	_____
EarthSci 2155:	_____	_____	4	_____

and:

EarthSci 1122:	_____	_____	4	_____
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(Where available, an Honors version of a course listed above can substitute for the non-Honors version.)

MINOR PROGRAM:

Complete a minimum of 12 semester credit hours, as follows:

a) Complete Earth Sci 4501:

EarthSci 4501:	_____	_____	4	_____
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b) Complete a minimum of 8 semester credit hours, chosen from the following courses:

EarthSci 4502:	_____	_____	4	_____
EarthSci 5602.01:	_____	_____	2	_____
EarthSci 5602.02:	_____	_____	2	_____
EarthSci 5613:	_____	_____	4	_____
EarthSci 5614:	_____	_____	4	_____

EarthSci 5615: _____ 4 _____

EarthSci 5621: _____ 3 _____

EarthSci 5206: _____ 3 _____

TRANSITION POLICY

Students who began progress toward a Minor in Geological Sciences (defined as having completed at least one course within an existing track) under quarters will not be penalized as we move to semesters, either in terms of progress towards their degree or their expected date of graduation. Arrangements will be made for individual students on a case-by-case basis by advisors within Earth Sciences, but we anticipate few complications because of the flexibility provided by the structures of our existing tracks, combined with the anticipated regularity and variety of 2000-, 3000-, 4000-, and 5000-level course offerings within SES. Few of the courses within these tracks occur in well-defined sequences – and those sequences that do exist are undergoing a direct course-to-course conversion -- so a student should be able to move easily between individual upper-level courses within SES. As a result, we do not see the need for any bridge courses in Earth Sciences.