

**MEMORANDUM TO:** Ogden College of Science and Engineering Curriculum Committee

Dr. Jack Rudolph	Dr. James Gary	Dr. Greg Arbuckle
Dr. Martin Stone	Dr. Rong Yang	Dr. John Khouryieh
Dr. Bruce Schulte	Dr. Julie Ellis	Dr. Bruce Kessler
Dr. Phil Lienesch	Dr. Warren Campbell	Dr. Richard Schugart
Dr. Cathleen Webb	Dr. David Keeling	Dr. Keith Andrew
Dr. Hemali Rathnayake	Dr. Xingang Fan	
Dr. Les Pesterfield		

**FROM:** Kenneth Crawford, Chair

**SUBJECT:** Agenda for Thursday, October 10, 2013, 4:00 p.m. in COHH 4123

**A. OLD BUSINESS:**

- I. Consideration of the minutes of the September 5, 2013 meeting.

**B. NEW BUSINESS:**

Consent Items

Department of Architectural and Manufacturing Sciences

- I. Proposal to Delete a Course
  - a. GC 313, Technical Drafting, 3 hrs.
- II. Proposal to Revise Course Prerequisites
  - a. AMS 303, Food Laws & Regulations, 3 hrs.

Action Items

Department of Engineering

- I. Proposal to Create a New Course
  - a. ENGR 400, Principles of Systems Engineering, 3 hrs.
- II. Proposal to Create a New Minor Program
  - a. Minor in Systems Engineering, 21 hrs. (CE Majors), 21.5 hrs. (EE Majors), 21 hrs. (ME Majors)

SKyTeach

- I. Proposal to Revise a Program
  - a. Ref. #734, Middle School Science Education ("MSSE"), 46 hrs.

**C. OTHER BUSINESS**

**MEMBERS PRESENT:**

Dr. Phil Lienesch  
Dr. Cathleen Webb  
Dr. Les Pesterfield  
Dr. James Gary  
Dr. Rong Yang  
Dr. Julie Ellis  
Dr. Warren Campbell

Dr. David Keeling  
Dr. Xingang Fan  
Dr. Greg Arbuckle  
Dr. John Khouryieh  
Dr. Mark Robinson for Dr. Bruce Kessler  
Dr. Richard Schugart  
Dr. Keith Andrew

**FROM:** Ken Crawford, Chair

**OLD BUSINESS:**

Keeling/Campbell moved approval of the minutes from the April 4, 2013, meeting. Motion passed.

**NEW BUSINESS:**

**Information Items**

Proposal to Create a Temporary Course, ENGR 250, Early Engineering Experiences in Industry and Proposal to Revise Course Prefix (Meteorology), GEOG were presented as information only items. No action was required.

**Consent Agenda**

All consent items were passed as presented on a Keeling/Arbuckle motion with the exception of AMS 120, Basic Electricity and AMS 356, Food Processing: Unit Operations. AMS 120 was moved to the action agenda on a Schurgart/Keeling motion and AMS 356 was moved to the action agenda on an Arbuckle/Keeling motion.

**Action Agenda**

**Department of Architectural and Manufacturing Sciences**

Keeling/Campbell moved approval of the proposal to revise course prerequisites, AMS 120, Basic Electricity. Motion passed.

Keeling/Campbell moved approval of the proposal to revise course prerequisites, AMS 356, Food Processing: Unit Operations. Motion passed with friendly amendment to correct the name to Systems Design and Operation.

Keeling/Campbell moved approval of the proposal to revise a program, Ref. #506, Advanced Manufacturing. Motion passed.

Keeling/Campbell moved approval of the proposal to revise a program, Ref. #1718, Food Processing and Technology. Motion passed.

**Department of Geography and Geology**

Keeling/Campbell moved approval of the proposal to make multiple revisions to a course, GEOG 464, Geography of Europe. Motion passed.

Keeling/Campbell moved approval of the proposal to revise course credit hours, GEOG 391, Spatial Data Analysis and Interpretations. After discussion regarding a change to the overall program, Dr. Keeling decided to table the proposal definitely and send it through with the program changes.

Keeling/Arbuckle moved approval of the proposals to create a new course, GEOG 226, Our Dangerous Planet and GEOG 227, Our Vulnerable Planet as one item. Motion passed.

**OTHER BUSINESS:**

Dr. John Khouryieh volunteered to be the Ogden College representative to the UCC.

Ellis/Keeling moved to adjourn at 4:36 p.m.

Proposal Date: 9/26/13

**Ogden College of Science and Engineering  
Department of Architectural & Manufacturing Sciences  
Proposal to Delete a Course  
(Consent Item)**

Contact Person: Dr. Greg Arbuckle, greg.arbuckle@wku.edu, 745-6592

**1. Identification of course:**

- 1.1 Current course prefix (subject area) and number: GC 313
- 1.2 Course title: Technical Drafting
- 1.3 Credit hours: 3

**2. Rationale for the course deletion:** This course has not been offered in over 10 years. All other courses with this prefix were either deleted many years ago or were incorporated into the AMS prefix. Somehow this one course persisted. This is a "housekeeping" issue.

**3. Effect of course deletion on programs or other departments, if known:**

None

**4. Proposed term for implementation:**

Spring 2014

**5. Dates of prior committee approvals:**

AMS Department/Division: 09/26/2013

Ogden Curriculum Committee \_\_\_\_\_

Undergraduate Curriculum Committee \_\_\_\_\_

University Senate \_\_\_\_\_

**Attachment: Course Inventory Form**

**Ogden College of Science & Engineering  
Department of Architectural & Manufacturing Sciences  
Proposal to Revise Course Prerequisites  
(Consent Item)**

Contact Person: John Khouryieh, [hanna.khouryieh@wku.edu](mailto:hanna.khouryieh@wku.edu), 270-745-4126

**1. Identification of course:**

- 1.1 Course prefix (subject area) and number: AMS 303
- 1.2 Course title: Food Laws & Regulations

**2. Current prerequisites: AMS 301**

**3. Proposed prerequisites: None**

**4. Rationale for the revision of prerequisites:**

The purpose of this course is to provide students with a basic knowledge of and familiarity with the principal laws and regulations governing raw and processed foods. The course content does not require knowledge of the science of food.

Below are some examples of universities that offer this course without prerequisites: Michigan State University, University of Arkansas, University of Georgia, University of Wisconsin-Madison, Texas A&M University, University of Tennessee, and Purdue University.

**5. Effect on completion of major/minor sequence: None**

**6. Proposed term for implementation: Fall 2014**

**7. Dates of prior committee approvals:**

AMS Department

09/20/2013

OCSE Curriculum Committee

Undergraduate Curriculum Committee

University Senate

Proposal Date: April 9, 2013

**Ogden College of Science and Engineering**  
**Department of Engineering**  
**Proposal to Create a New Course**  
**(Action Item)**

Contact Person: Stacy Wilson; [stacy.wilson@wku.edu](mailto:stacy.wilson@wku.edu); 745-5848

**1. Identification of proposed course:**

- 1.1 Course prefix (subject area) and number: ENGR 400
- 1.2 Course title: Principles of Systems Engineering
- 1.3 Abbreviated course title: Systems Engineering
- 1.4 Credit hours and contact hours: 3 credit hours, 3 contact hours
- 1.5 Type of course: A – Applied Learning
- 1.6 Prerequisites: Junior standing in an engineering discipline; and EE 210 or EM 221, or EM 222 and STAT 301
- 1.7 Course catalog listing: An overview of the field and relevant principles of systems engineering. Topics will prepare students to apply systems engineering theory to the solution of complex system-based engineering problems.

**2. Rationale:**

- 2.1 Reason for developing the proposed course:  
Systems engineering is an iterative approach to problem solving that examines all stages of a system's life cycle: design/development, production/construction, operation/maintenance, and retirement/disposal. Systems engineers develop high-quality, cost-effective solutions that meet the needs of their customers. NASA has identified systems engineering as "a critical core competency in enabling current and future mission success"  
(<http://www.nasa.gov/offices/oce/appel/seldp/index.html>).  
The importance of understanding systems engineering principles and practices is becoming widely known in the engineering community. This course is the foundation course for the systems engineering minor.
- 2.2 Projected enrollment in the proposed course: 10-15 students per offering.  
The primary constituents of this program initially will be majors in civil, electrical and mechanical engineering. It is projected that approximately 25 students will participate in the systems engineering minor per year. This estimate is determined by anticipating that 40% of a cohort of students will enroll in the minor each year. The percentage used in this estimation was determined by examining the number of students who enrolled in the initial offering of the principles of systems engineering course in the fall 2012 and summer 2013. Each student participating in the minor will be required to enroll in this course.



- 2.3 Relationship of the proposed course to courses now offered by the department:  
There are no similar courses currently offered in the department. However, this course will complement the design courses offered in each program.
- 2.4 Relationship of the proposed course to courses offered in other departments:  
There are no other similar courses offered in other departments.
- 2.5 Relationship of the proposed course to courses offered in other institutions:  
Data available from INCOSE (International Council on Systems Engineering) indicates growth in systems engineering programs, with the number of masters programs in systems engineering growing faster in comparison to the number of undergraduate and doctoral programs. For example, within the USA there are currently 13 Bachelor of Science, 41 Master of Science, and 14 PhD programs that include the words “systems engineering” in their title. However, an infusion of systems thinking and limited exposure to systems engineering principles is beginning to appear in many undergraduate engineering curricula. Within the WKU engineering programs, the use of scenario- or project-based education and team projects has been its cornerstone since inception. These experiences provide the opportunity for students to apply “systems engineering” to real-world problems.

### **3. Discussion of proposed course:**

- 3.1 Course objectives: The objective of this course provides the student with an introduction to systems engineering principles. The course is also intended to prepare the student for their capstone design course. Additional learning objectives include:
- to develop a systems engineering perspective of how complex systems are conceived;
  - to establish and increase the knowledge and comprehension of the value and purpose of systems engineering;
  - to establish a working knowledge of methods and tools systems engineers use; and
  - to understand the roles of systems engineers and gain the ability to contribute to the development of complex systems.
- 3.2 Content outline:
- The systems engineering process
  - Requirements
  - Design fundamentals
  - Subsystem fundamentals
  - Trade studies
  - Integration
  - Technical reviews
  - Case studies and ethics

- 3.3 Student expectations and requirements:  
Student performance will be assessed using examinations, papers, and presentations.
- 3.4 Tentative texts and course materials:  
Systems Engineering and Analysis, Benjamin S. Blanchard and Wolter J. Fabrycky, Prentice Hall, 5<sup>th</sup> Edition, 2011.

**4. Resources:**

- 4.1 Library resources: See attached library resources form.
- 4.2 Computer resources: The course will use computer resources that are currently available to students in the Department of Engineering.

**5. Budget implications:**

- 5.1 Proposed method of staffing: Current faculty and staff in the Department of Engineering will be used to staff the course. The civil, electrical and mechanical engineering programs require technical elective courses. It is intended that this course will also be periodically offered as technical elective courses in these programs so that there will be no additional teaching load required during the academic year. It is also anticipated that this course will be offered during the summer term.
- 5.2 Special equipment needed: none
- 5.3 Expendable materials needed: none
- 5.4 Laboratory materials needed: none

**6. Proposed term for implementation: Spring 2014**

**7. Dates of prior committee approvals:**

Engineering Department	_____ 4/30/13 _____
OSCE Curriculum Committee	_____
Undergraduate Curriculum Committee	_____
University Senate	_____

**Attachment: Bibliography, Library Resources Form, Course Inventory Form**



**Ogden College of Science and Engineering**  
**Department of Engineering**  
**Proposal to Create a Systems Engineering Minor Program**  
**(Action Item)**

Contact Person: Robert E. Choate, [robert.choate@wku.edu](mailto:robert.choate@wku.edu), 745-8852

**1. Identification of program:**

- 1.1 Program title: Systems Engineering
- 1.2 Required hours in minor program: 21 (CE Majors), 21.5 (EE Majors) or 21 (ME Majors)
- 1.3 Special information: none
- 1.4 Catalog description: Systems engineering is a robust approach to the design, creation, and operation of systems.

**2. Rationale:**

- 2.1 Reason for developing the proposed minor program:  
Several significant trends in the global environment are leading to the emergence of a more widespread and effective application of the systems engineering practice. There is a growing realization that systems engineering is essential to successfully design, develop and sustain the highly complex systems of the 21st century. Therefore, an increasing number of universities are offering programs in systems engineering, while simultaneously a number of corporations in the commercial and defense sectors have articulated needs for systems engineering skills and competencies. The demand in these sectors is strong for trained, experienced systems engineers, especially those who can think holistically about complex problems, are comfortable with the increasing complexity of systems that address those problems, can manage the uncertainty and complexity of the environment in which those systems are being built, and can respond to demands to shorten the time to deliver systems to the field.
- 2.2 Projected enrollment in the proposed minor program:  
The primary constituents of this program initially will be majors in civil, electrical and mechanical engineering. It is projected that approximately 25 students will participate in this minor per year. This estimate is determined by anticipating that 40% of a cohort of engineering students will enroll in the minor each year. The percentage used in this estimation was also supported by the number of students who enrolled in the initial offering of the principles of systems engineering course in the fall 2012 and summer 2013.
- 2.3 Relationship of the proposed minor program to other programs now offered by the department:  
In the proposed structure for engineering at WKU, a core of systems engineering courses will be used to expand the traditional engineering disciplines (e.g. civil

engineering, electrical engineering, mechanical engineering) currently offered by the department. Therefore, the groundwork established by the Department of Engineering will be strengthened and diversified by the inclusion of a systems engineering minor curriculum.

- 2.4 Relationship of the proposed minor program to other university programs:  
Numerous elective courses and programs outside of WKU engineering were reviewed (e.g., manufacturing sciences, business, mathematics and statistics) for comparison and possible inclusion in the minor. Of particular interest was the minor in statistics. However, the initial offering is limited to engineering majors with future expansion to an interdisciplinary approach desired. In this manner, education in systems thinking and systems engineering can begin to permeate WKU, and future collaborations, such as with the statistics minor, will be established among departments and colleges. There is likely to be fluidity of curricula and a resulting fluidity of faculty among these departments and programs. The expectation is that systems engineering will remain an area of study of its own; however, there is a potential for the study of systems thinking to become interwoven into our academic fabric.
- 2.5 Similar minor programs offered elsewhere in Kentucky and in other states (including programs at benchmark institutions): There are currently no systems engineering minors at any Kentucky institution and only one benchmark institution, University of North Carolina – Charlotte, has a Bachelor of Science Program in Systems Engineering (BSSE).
- 2.6 Relationship of the proposed minor program to the university mission and objectives:  
The field of systems engineering is emerging as a connector between many of the traditional engineering fields. The proposed minor in systems engineering will offer students the opportunity to expand their understanding of systems and how the effective management of systems influences virtually every aspect of our global societal challenges. Students who complete this minor will be better prepared to successfully solve many of these modern engineering challenges. It is the mission of WKU engineering to prepare students of all backgrounds to be productive, engaged, and socially responsible citizen-leaders of a global society. This minor will only serve to enhance the university mission and objectives.
3. **Objectives of the proposed minor:**  
A systems engineering minor will provide a pathway for students through an extension of regular engineering courses. This is consistent with the industry attitude that engineering students need a foundational background in one of the traditional engineering disciplines, plus practical, real-world experience to become effective as systems engineers. Unlike systems-centric programs, which treat systems engineering as a separate discipline where most of the courses are taught focusing on systems engineering principles and practice, our domain-centric program offers systems engineering as an option that can be exercised

within another major field in engineering. Therefore, the objectives for the graduate in engineering with a systems engineering minor are:

- to attain programmatic or technical leadership roles in an organization identifying, formulating, designing and/or testing practical solutions to engineering problems and guide the engineering development of modern complex and interdisciplinary systems; while,
- employ systems engineering methods and tools in the development of advanced complex and interdisciplinary systems.

**4. Curriculum:**

The Systems Engineering Minor requires a minimum of 21 hours for CE and ME majors and 21.5 hours for EE majors. Students must complete 12 or 12.5 hours of required courses and choose a minimum of 9 hours from elective courses as shown in Tables 1 and 2 below.

Table 1: Systems Engineering Minor Required Courses

Course	Description	Credit Hours
EE 210 or EM 221 or EM 222	Circuits and Networks I or Engineering Statics	3.5 (EE) or 3 (CE or ME)
STAT 301	Applied Statistics	3
ENGR 400	Principles of Systems Engineering	3
CE 498 or EE 401 or ME 412	Capstone Project*	3
<b>TOTAL</b>		<b>12.5 (EE) or 12 (CE/ME)</b>

\* A panel review of the student senior project proposal is required. The proposal must incorporate systems engineering principles outlined in ENGR 400.

Table 2: Systems Engineering Minor Elective Courses (**Minimum Required: 9 Credit Hours**)

Course	Description	Credit Hours
CE 303/304	Construction Management/Lab	3/1
CE 4xx**	CE Technical Electives	6
EE 460	Continuous Control Systems	4
EE 4xx**	EE Technical Electives	6
EM 313	Dynamics	3
ME 49x**	ME Technical Electives	6

\*\* The technical elective must incorporate or expand on systems engineering principles as outlined in ENGR 400 Principles of Systems Engineering. Technical elective courses currently meeting this intent include but are not limited to: CE300 Floodplain Management, CE326 Engineering Law, CE360 Estimating Scheduling Bidding, CE361 Estimating Lab, CE366 Mechanical and Electrical Systems, CE378 Route Surveying, CE379 Route Surveying Lab, CE380 Boundary Surveying, CE381 Boundary Surveying Lab, CE383 Structural Steel Design, CE384 Reinforced Concrete Design, CE426

Advanced Structural Materials, CE436 Design/ Construction Integration, CE440 Masonry Design and Construction, CE441, Masonry Construction Lab, CE451 Water and Wastewater Treatment, CE462 Hydraulic Engineering Systems, CE466 Contracts and Specifications, CE476 Highway Construction, CE486 Steel and Concrete Construction, EE410/411 Computer Design, EE443 Microfabrication and MEMS, EE 431 Introduction to Power Systems, EE432 Power Systems II, EE461 Discrete Control Systems, EE443 Communication Applications, ME49X Reliability Engineering, ME49X Advanced Strength of Materials, ME 49X, Energy Conversion and Sustainability, ME49X Failure Analysis and Prevention, ME 49X Finite Element Analysis and ME49X Kinematics and Dynamics.

5. **Budget implications:** The courses within the new minor will be and have been regularly taught as engineering science elective courses. Students will choose elective courses that fulfill the minor. The teaching load for the engineering faculty will not be increased as a result of implementing the minor.

6. **Proposed term for implementation:** Spring 2014

7. **Dates of prior committee approvals:**

Engineering Department/Division: 4/30/13

Ogden College Curriculum Committee \_\_\_\_\_

Professional Education Council (if applicable) \_\_\_\_\_

General Education Committee (if applicable) \_\_\_\_\_

Undergraduate Curriculum Committee \_\_\_\_\_

University Senate \_\_\_\_\_

**Attachment: Program Inventory Form**



**Ogden College of Science and Engineering  
Office of the Dean  
Proposal to Revise A Program  
(Action Item)**

Contact Person: Les Pesterfield, [lester.pestterfield@wku.edu](mailto:lester.pestterfield@wku.edu), 745-3603

**1. Identification of program:**

- 1.1 Current program reference number: 734
- 1.2 Current program title: Middle School Science Education (“MSSE”)
- 1.3 Credit hours: 46

**2. Identification of the proposed program changes:**

- 2.1 Increase the number of hours in the major from 46 to 47
- 2.2 Clarify credit-hour designations for BIO 303 and CHEM 470
- 2.3 Clarify number of required restricted electives

**3. Detailed program descriptions:**

Current program	Proposed program
<p>General:</p> <ul style="list-style-type: none"> <li>1. 23 hours of introductory science core courses are required.</li> <li>2. A science research methods course, SMED 360, is required.</li> <li>3. <b>20 hours</b> of upper level science courses are required including a required course in each of the five disciplines and <b>one from a list of restricted electives.</b></li> <li>4. Completion of MATH 117 or 136 or 142 as a support course is required.</li> <li>5. All courses must be completed with a grade of C or better. All science courses must be completed with an average GPA of 2.75 or better.</li> <li>6. Students must also complete the SMED major.</li> </ul>	<p>General:</p> <ul style="list-style-type: none"> <li>1. 23 hours of introductory science core courses are required.</li> <li>2. A science research methods course, SMED 360, is required.</li> <li>3. <b>21 hours</b> of upper level science courses are required including a required course in each of the five disciplines and <b>two from a list of restricted electives.</b></li> <li>4. Completion of MATH 117 or 136 or 142 as a support course is required.</li> <li>5. All courses must be completed with a grade of C or better. All science courses must be completed with an average GPA of 2.75 or better.</li> <li>6. Students must also complete the SMED major.</li> </ul>
<p>Required introductory science courses (23hrs)</p> <p>ASTR 104      Astronomy of the                          Solar System (3) or ASTR 106   Astronomy of</p>	<p>Required introductory science courses (23 hours)</p> <p>ASTR 104      Astronomy of the                          Solar System (3) or ASTR 106   Astronomy of</p>

<p style="text-align: center;">Stellar Systems (3)</p> <p>BIOL 120/121 Biological Concepts: Cells, Metabolism, and Genetics (4)</p> <p>BIOL 122/123 Biological Concepts: Evolution, Diversity &amp; Ecology (4)</p> <p>CHEM 105/106 Fund. of Gen. Chemistry (4) or CHEM 120/121 College Chemistry I (5)</p> <p>GEOL 111/113 The Earth (4) OR GEOL 112/114 Earth History (4)</p> <p>PHYS 201 College Physics I (4) or PHYS 231/232 College Physics and Biophysics I (4)</p>	<p style="text-align: center;">Stellar Systems (3)</p> <p>BIOL 120/121 Biological Concepts: Cells, Metabolism, and Genetics (4)</p> <p>BIOL 122/123 Biological Concepts: Evolution, Diversity &amp; Ecology (4)</p> <p>CHEM 105/106 Fund. of Gen. Chemistry (4) or CHEM 120/121 College Chemistry I (5)</p> <p>GEOL 111/113 The Earth (4) OR GEOL 112/114 Earth History (4)</p> <p>PHYS 201 College Physics I (4) or PHYS 231/232 College Physics and Biophysics I (4)</p>
<p>Science research course: SMED 360 Research Methods for Mathematics and Science Teachers (3)</p>	<p>Science research course: SMED 360 Research Methods for Mathematics and Science Teachers (3)</p>
<p>Upper level science courses (<b>20 hours</b>):</p> <p><b>All of following courses (17 hours):</b></p> <p>ASTR 405 Astronomy for Teachers (3)</p> <p><b>BIOL 303 Life Sciences for Middle Grades Teachers (4)</b></p> <p><b>CHEM 470 Chemistry/Middle School (4)</b></p> <p>GEOL 305 Earth Systems Science for Teachers (3)</p> <p>PHYS 410 Physics for Teachers (3)</p> <p><b>One restricted elective (min. 3 hours) from:</b></p> <p>BIOL 319/322 Molecular and Cell Biology (4)</p> <p>BIOL 325 Insect Biodiversity (3)</p> <p>BIOL 326 Ornithology (3)</p> <p>BIOL 327 Genetics (4)</p> <p>BIOL 334 Animal Behavior (3)</p> <p>BIOL 348 Plant Taxonomy (3)</p> <p>GEOG 471 Natural Resource Mgt. (3)</p> <p>GEOL 308 Structural Geology (4)</p> <p>GEOL 310 Global Hydrology (3)</p> <p>GEOL 311 Oceanography (3)</p> <p>GEOL 325 Intro Minerals and Rocks (3)</p> <p>GEOL 380 Intro Field Techniques (3)</p> <p>GEOL 405 Paleontology (4)</p> <p>SMED 300 Middle Grade Science Skills (3)</p>	<p>Upper level science courses (<b>21 hours</b>):</p> <p><b>All of following courses (15 hours):</b></p> <p>ASTR 405 Astronomy for Teachers (3)</p> <p><b>BIOL 303 Life Sciences for Middle Grades Teachers (3)</b></p> <p><b>CHEM 470 Chemistry/Middle School (3)</b></p> <p>GEOL 305 Earth Systems Science for Teachers (3)</p> <p>PHYS 410 Physics for Teachers (3)</p> <p><b>Two restricted elective (min. 6 hours) from:</b></p> <p>BIOL 319/322 Molecular and Cell Biology (4)</p> <p>BIOL 325 Insect Biodiversity (3)</p> <p>BIOL 326 Ornithology (3)</p> <p>BIOL 327 Genetics (4)</p> <p>BIOL 334 Animal Behavior (3)</p> <p>BIOL 348 Plant Taxonomy (3)</p> <p>GEOG 471 Natural Resource Mgt. (3)</p> <p>GEOL 308 Structural Geology (4)</p> <p>GEOL 310 Global Hydrology (3)</p> <p>GEOL 311 Oceanography (3)</p> <p>GEOL 325 Intro Minerals and Rocks (3)</p> <p>GEOL 380 Intro Field Techniques (3)</p> <p>GEOL 405 Paleontology (4)</p> <p>SMED 300 Middle Grade Science Skills (3)</p>



SMED 400 Applying Middle Grade Science Across Disciplines (3)	SMED 400 Applying Middle Grade Science Across Disciplines (3)
Support course	Support course
MATH 117 Trigonometry (3) or MATH 136 Calculus I (4) or MATH 142 Calculus with Applications for Life Sciences (5)	MATH 117 Trigonometry (3) or MATH 136 Calculus I (4) or MATH 142 Calculus with Applications for Life Sciences (5)

**4. Rationale for the proposed program change:**

The Middle School Science Education major (reference number 734) requires a total of 46 hours of coursework. The University requires that at least half the hours in the major be at the 300-level or above. In the current program, both CHEM 470 Chemistry for Middle School Teachers and BIOL 303 Life Sciences for Middle Grades Teachers are designated as 4-credit-hour courses. However, those courses are offered as 3-credit-hour courses. As a result, students are 2 credit hours short of satisfying the University requirement that at least half the hours in the major be at the 300-level or above. Therefore, students must take an additional course at the 300-level or above to satisfy the requirement.

The proposed changes reflect a correction to the number of credit hours designated for CHEM 470 and BIOL 303 and a clarification in the number of restricted upper division courses required to complete the major.

**5. Proposed term for implementation and special provisions (if applicable):**

Fall semester 2014

**6. Dates of prior committee approvals:**

SKyTeach Faculty	<u>September 4, 2013</u>
Ogden Dean's Office	<u>September 23, 2013</u>
Ogden College Curriculum Committee	_____
Professional Education Council	_____
Undergraduate Curriculum Committee	_____
University Senate	_____