TLC – ADED Program revisions

Program revisions including: reducing overall credit hours for program concentrations in ESCI, PHSC, LFSC, LFCM, ISCI-ESCI, ISCI-PHY, ISCI-LFSC, ISCI-CHEM; correct prerequisite errors (adding or deleting); updating roadmaps to reflect changes in course titles, etc.; Course changes include adding, deleting, and new sequences in completion. Total program hours change from 155 to 143. Effective Fall 2010.

Letter of Transmittal

Date: 11/3/2009

To: Curriculum Committee

From: Lisa A. Donnelly, Ph.D.
Aeran Choi, Ph.D.

ADED Science Education Faculty
404 White Hall
Kent State University

Dear Curriculum Committee,

Please find the enclosed proposal for revising the course requirements for the ADED (Adolescence and Adult Education) Science majors (physical science, earth science, life science, life science/chemistry, integrated science with emphases in life science, physics, chemistry, or earth science).

This proposal has been developed to serve four goals:
1. Reduce overall credit hours for the programs, as per directive from Associate Dean;
2. Increase the number of NCATE/NSTA (accreditation) competencies met;
3. Correct prerequisite errors (by either including appropriate prerequisites or deleting courses for which prerequisites could not be met); and
4. Updating the requirement sheets to reflect changes that have occurred within course offerings in the College of Arts and Sciences.

The proposal has been developed in consultation with several Arts and Sciences faculty members throughout the revision process, beginning April 2009 and extending through November 2009.

Ideally, these revisions would be in effect for the Fall 2010 catalog such that the above-mentioned problems are better addressed for incoming freshmen.

We thank you tremendously for your consideration, recommendations, and support.

Sincerely,

Lisa A. Donnelly, Ph.D.

Approved TLC Curriculum Committee: 11/10/09

Proposal Summary

Title: ADED Program Revision

Subject Specification: This proposal outlines course requirement revisions to the 5 ADED (Adolescence and Adult Education) Science majors: physical science (PHSC), earth science (ESCI), life science (LFSC), life science/chemistry (LFCM), and integrated science (ISCI) with four emphases including chemistry (ISCI-CHEM), life science (ISCI-LFSC), earth science (ISCI-ESCI), and physics (ISCI-PHYS).

Background Information:
The ADED Science program leads to teaching licensure in a number of science teaching areas: earth science, life science, life science/chemistry, physical science, and integrated science with an emphasis in either life science, chemistry, physics, or earth science. The ADED students (undergraduates) complete the coursework leading to a bachelors degree as well as licensure. Each program is subject to the National Council for Accreditation of Teacher Education/ National Science Teacher Association (NCATE/NSTA) competency standards that are used to guide our accreditation.

Teacher preparation is a combination of robust knowledge in their teaching fields, pedagogical knowledge that allows them to develop developmentally-appropriate lessons for their pre-college students, and confidence and pedagogical wisdom achieved by practice in actual secondary settings. Teacher education may begin at the university level, but it continues throughout a teacher's professional life. The proposed changes outline undergraduate content course reduction, changes, and additions are aligned with our accrediting body's (NCATE/NSTA) recommendations to enable the development of robust content knowledge necessary for beginning science teachers. However, we recognize that more content knowledge and more pedagogical knowledge are always ideal. Kent State University also offers several content-related options for enhancing content knowledge of practicing teachers (e.g. grant-funded professional development and graduate courses such as Operation Physics or Conceptual Chemistry, the Master of Arts in Biology program, and the Masters in Curriculum and Instruction). The proposed changes are aligned with this view of teacher development as a continuous relationship between teachers, K-12 schools, and the university.

The specific rationale for the proposed revisions is rooted in several problems that have been identified within the current programs: too many credit hours to be completed in the recommended (4 or 5-year) time-frame, courses that have changed in other departments necessitating ADED program updates, students lacking necessary prerequisites for current program requirements, and several missing NCATE/NSTA accreditation competencies. Thus, the proposed program revisions will accomplish several goals:

1. Reduce overall credit hours for the programs, as per directive from Associate Dean;
2. Increase/maintain the number of 2003 NCATE/NSTA (accreditation) competencies met as a measure of the robust content knowledge necessary for secondary science teaching;
3. Correct prerequisite errors (by either including appropriate prerequisites or deleting courses for which prerequisites could not be met);
4. Updating the requirement sheets to reflect changes that have occurred within course offerings in the College of Arts and Sciences;

5. Interally align the programs such that students can more readily switch between the 4-year licenses and the 5-year Integrated Science license (a highly-marketable license given that these teachers can teach all science subjects grades 7-12); and
6. Remove obstacles for transfer students by making the Liberal Education Requirements less restrictive.

The enclosed proposal calls for course elimination, course addition, and course changes (substituting a similar course covering the same content) in required courses for the 5 ADED majors according to the table below:

Major	Proposed Actions	Credit Hours (Current/Proposed)	NCATE/NSTA % Competencies Met (Current/Proposed)
ESCI	Eliminate 4, Change 1, Add 2 courses	141/133	87.5/95.8
PHSC	Eliminate 4, Change 4 courses	143/132	92.3/92.0
LFSC	Eliminate 7, Change 1, Add 4 courses	147/132	81.8/90.9
LFCM	Eliminate 4, Change 3, Add 2 courses	142/134	83.5/89.8
ISCI-ESCI	Eliminate 7, Change 2, Add 3 courses	155/143	94.8/97.0
ISCI-PHY	Eliminate 5, Change 2, Add 1 course	159/148	97.0/96.3
ISCI-LFSC	Eliminate 5, Change 1, Add 1 course	158/144	96.2/97.0
ISCI-CHEM	Eliminate 4, Change 3 courses	155/144	98.6/97.8

*Please note that the total number of hours listed for the current majors on the current "roadmap" documents are incorrect.

The following table provides an overview of the credit hours required within specific science disciplines before (B) and after (A) the proposed changes:

Major	Chemistry		Physics		Biology		Geology		Geography	
	B	A	B	A	B	A	B	A	B	A
ESCI	10	10	8	13	8	8	23	19	12	9
LFSC	18	18	8	10	34	26	4	4	3	0
LFCM	22	24	10	10	26	22	4	4	0	0
PHSC	26	27	25	22	4	4	3	0	3	3
ISCI_L	18	18	16	13	26	22	12	11	6	6
ISCI_E	18	16	16	13	15	15	23	19	6	6
ISCI_P	17	18	25	22	15	15	11	8	6	6
ISCI_C	27	28	16	13	15	15	11	8	6	6

The proposed program revisions will impact current programs, offerings, students, and staff. The proposed changes will impact enrollment (via increases and decreases) in courses offered by the following College of Arts and Sciences departments: Communications, Sociology, Biology, Chemistry, Physics, Geology, and Geology. The proposed changes will also increase or maintain the number of NCATE/NSTA competencies met by each major, thus improving the quality of the program for our students. The following individuals have offered letters of input, acknowledgement, or support for the proposed changes:

Professor	Position	Department
Mark Manley	Professor, Undergraduate Coordinator	Physics
Paul Sampson	Professor, Assistant Chair	Chemistry
Rozell Duncan	Assistant Professor, Coordinator of Undergraduate Studies	Communications
Neil Wells	Professor, Assistant Chair and Undergraduate Advisor	Geology

The scope of the proposed program revisions is actually quite small, given the small number of secondary science preservice teachers involved in these programs. For example, the total number of ADED science students including all 5 majors was 7 in 2007, 8 in 2008, and 12 in 2009. Given the small number of students, the fiscal impact of action would likely be minimal.

Because the proposed changes do not impact the GPS program descriptions and do not alter the AQIP goals specifically, these documents are not included in this proposal.

Alternatives and Consequences: The alternative to decreasing the course credit hour requirements for each of four 4-year majors (PHSC, ESCI, LFSC, LFCM) is to list these as 5-year majors. The major drawback to this alternative is that students would be much less likely to be recruited into and persist within a 5-year major.

The consequences for inaction for this program revision would be far-reaching. Immediately, advising would be problematic because (1) the current programs cannot be fit within a 4-year roadmap and (2) some of the Arts and Sciences courses required by the current program have changed. Over a larger timespan, students will be less willing to enroll and persist in these programs because they cannot be completed in the recommended timeframe. We are already experiencing these persistence problems in that students who get out of sequence or must repeat a class have withdrawn from this major.

Specific Recommendation and Justification: Specifically, we propose program revisions that enable the four 4-year majors (PHSC, ESCI, LFSC, and LFCM) to be completed within a four-year timeframe and allow the four 5-year ISCI majors to be more easily completed in 5 years (with a possibility of completion in four years in summer courses are to be taken). We believe that these proposed changes will enhance recruitment and retention, better align our programs with our NCATE/NSTA competencies, update course offering changes made in other departments, and correct prerequisite errors present in the current programs.

Timetable and Actions Required: The following timetable describes the actions required to develop and implement this proposal.

Action	Date
ADED Science faculty meet to discuss/develop changes	April 2009
Meet with A&S faculty to discuss possible changes	May 2009
ADED Science faculty re-craft proposal, revise roadmaps, program sheets	Sept.-Oct. 2009
Seek and retain feedback from A&S faculty	Oct. 2009
School Curriculum Committee Review & Approval	Nov. 2009
EHHS College Curriculum Committee Review & Approval	Dec. 2009
Provost Review & Approval	Dec. '09/Jan. '10
Educational Policies Council Review & Approval	Jan. 25, 2010
Program Revisions implemented as part of Fall 2010 Catalog	Fall 2010

Undergraduate Catalog

Adolescence/Young Adult (7-12 Licensure) Program

Advising sheets for all majors are available on the Vacca Office of Student Services' Web site at http://www.ehhs.kent.edu/OSS/. All education majors and minors are expected to meet with an education faculty advisor. These curricula lead to the Ohio Provisional License in Adolescence/Young Adult Education in a specific area valid for teaching in grades seven through 12.

Majors (B.S.E.):
Earth Science
Integrated Language Arts
Integrated Mathematics
Integrated Science
Integrated Social Studies
Life Science
Life Science/Chemistry
Physical Science

Students seeking admission to this program must meet all professional requirements for admission to advanced study. To be admitted to the program, students must display evidence of adequate communication skills; sound content area knowledge (language arts, mathematics, science or social studies); a basic understanding of the teaching profession; a basic understanding of adolescents; and dispositions aligned with the conceptual framework of the College of Education, Health, and Human Services, including being open-minded, flexible, caring and responsible. Faculty will select the most qualified applicants based on an interview; essay; letters of recommendation; GPA; Praxis I scores; and performance in English and communication studies coursework. Applicants to the ADED program must have experience working with young adults in a supervisory capacity, such as tutoring, camp counseling, volunteer work or related experience. Students should contact the College of Education, Health, and Human Services' Vacca Office of Student Services, 304 White Hall, during the first year of study to inquire about the procedures and criteria associated with admission to the adolescence/young adult education program.

Student teaching is offered only during spring semester. Students must work closely with their faculty advisors to position themselves for spring student teaching and to plan proper course sequencing. Students must apply for student teaching a year and a half in advance.

current catalog copy - no changes needed.

KENT STATE UNIVERSITY
CERTIFICATION OF CURRICULUM PROPOSAL

Preparation Date 27-Oct-09 Curriculum Bulletin _____

Effective Date Fall 2010 Approved by EPC _____

Department	TLC
College	EH - Education, Health and Human Services
Degree	BSE - Bachelor of Science in Education
Program Name	**Integrated Science Bachelor of Science in Education** Program Code **ISCI**
Concentration(s)	Earth Science Concentration(s) Code(s) ESCI
Proposal	Revise Program Requirement

Description of proposal:

The ADED (Adolescent Adult Education) Integrated Science program is a 5-year degree that leads to teaching licensure in all science, grades 7-12. The ADED students (undergraduates) complete the coursework leading to a bachelors degree as well as licensure. This program is subject to the NCATE/NSTA competency standards that are used to guide our program's accreditation.

Proposed Actions:

Delete	COMM 15000 Intro to Human Communication (3)
Delete	SOC 22778 Social Problems (3)
Delete	PHY 11030 7 Ideas that Shook the Universe (3)
Delete	GEOL 34061 Invertebrate Paleontology (4)
Delete	GEOG 41082 Geography of Soils (3)
Delete	CHEM 30101 Quantitative Analysis (2)
Delete	BSCI 20560 Invertebrate Zoology (4)
Change	COMM 26000 Criticism of Public Discourse (3) to "Choose ONE LER from HUMANITIES" (3)
Change	CHEM 30360 Aqueous and Descriptive Inorganic (2) to CHEM 30301 Inorganic Chemistry I (2)
Add	GEOG 41073 Conservation of Natural Resources (3)
Add	GEOL 21080 Oceanography (3)
Add	BSCI 20140 Cell Biology (4)

Does proposed revision change program's total credit hours? ☒ Yes ☐ No

Current total credit hours: 155 Proposed total credit hours 143

Describe impact on other programs, policies or procedures (e.g., encroachment and duplication issues; enrollment and staffing considerations; need; audience; prerequisites; teacher education licensure):

This curriculum proposal outlines changes to the current program. Specific courses have been added and deleted from the program. The proposed changes will accomplish four important goals:
(1) reduce overall credit hours for the program from 155 to 143 to make completion of the degree more manageable (please see associated "roadmaps");
(2) increase or maintain the number of NCATE (accreditation) competencies met from 127/134 (94.8%) to 130/134 (97.0%);
(3) update the program requirements to reflect changes that have occurred in other college's course offerings (e.g. CHEM 30360 Aqueous and Descriptive Inorganic has changed to CHEM 30301 Inorganic Chemistry I); and
(4) correct prerequisite errors by either including appropriate prerequisites or deleting courses for which prerequisites could not be met (e.g. eliminating GEOG 41082 Geography of Soils for which a prerequisite was not included in the previous program).

The proposed changes will impact enrollment in courses offered by the following College of Arts and Sciences departments: Communications, Sociology, Physics, Geology, and Chemistry.

Units consulted (other departments, programs or campuses affected by this proposal):

Arts and Sciences faculty from Biology and Chemistry were consulted in April 2009, and the Arts and Sciences faculty from Biology, Chemistry, Physics, and Geology were consulted again in October 2009.

REQUIRED ENDORSEMENTS

Department Chair / School Director / Campus Dean	11/12/09
College Dean	1/4/10
Executive Dean of Regional Campuses / Dean of Graduate Studies	/ /
Senior Vice President for Academic Affairs and Provost	/ /

RE: Program Requirement Changes for ADED Science Courses

DUNCAN, ROZELL

Sent: Thursday, December 17, 2009 9:02 PM

To: DONNELLY, LISA A.

Dr. Donnelly: This is to acknowledge receipt of your notice that COMM 15000 and COMM 26000 will no longer be a requirement for ADED majors. It is noted that COMM 26000 may be used as a Humanities LER for these same students. Thank you for notifying the School of Communication of these changes. Rozell Duncan

Rozell R. Duncan, Ph.D.
Assistant Professor, Advisor and
Undergraduate Coordinator
School of Communication Studies
Kent State University
P.O. Box 5190
Kent, Ohio 44242-0001
Phone: (330) 672-0184
Fax: (330) 672-3510
Email: rduncan@kent.edu

From: DONNELLY, LISA A.
Sent: Thursday, December 10, 2009 10:36 AM
To: DUNCAN, ROZELL
Subject: Program Requirement Changes for ADED Science Courses

Dear Dr. Duncan,

I wanted to let you know that the science education faculty in EHHS are proposing to change the requirements for the ADED Science students (the undergraduate students pursuing science education teaching licensure). Although our ADED Science enrollment is typically very small (10 students per year), I wanted to inform you of these changes because they may slightly impact your enrollments.

In the previous program requirements, our ADED majors were required to take COMM 15000 Intro to Human Communciation and COMM 26000 Critique of Plublic Discourse. Now, these are not being required any longer, although the students will have the opportunity to take the latter to fulfill their Humanities LER.

We have already submitted these proposal changes through our school-level curriculum committee, and these changes will be forwarded to our college curriculum committee soon. If possible, we would appreciate it if you could send an acknowledgement email documenting that you are now aware of these proposed changes as soon as is convenient for you.

Thank you, and please let me know if you have any questions at all.

Lisa Donnelly, Ph.D.
Assistant Professor of Science Education
Kent State University
330-672-0614

RE: ADED Science Program Changes

WELLS, NEIL

Sent: Tuesday, October 27, 2009 1:01 PM

To: DONNELLY, LISA A.

In your proposed changes document, you have Geography of soils listed as GEOL instead of GEOG, and in one of the programs you have Meteorlogy rather than Meteorology.

Students can take Earth History and Earth Dynamics in either order, although Earth Dynamics first is good.

Given heavy enrollments in the labs, they may have trouble getting into an intro lab, so they should be told in a footnote that they can take the labs in later semesters, including during the summer (i.e. in Earth History and Earth Dynamics, students do not have to take the lab the same semester that they take the lecture).

I need to pass this by someone else, and may have an additional comment later.

Neil Wells

From: DONNELLY, LISA A.
Sent: Tuesday, October 27, 2009 12:38 PM
To: SAMPSON, PAUL; CARLSON, ROBERT; WELLS, NEIL; MANLEY, MARK
Subject: ADED Science Program Changes

Dear Dr. Sampson, Dr. Carlson, Dr. Wells, and Dr. Manley,

As you know, the ADED faculty are in the process of revising the program requirements for our ADED science majors (earth science, life science, life science/chemistry, physical science, and integrated science with an emphasis in either life science, chemistry, physics, or earth science). We are making revisions to accomplish several goals (reducing overall credit hours as per directive from our associate dean, increasing the NCATE accreditation competencies met by each program, and correcting errors in prerequisites that had existed in the previous programs).

I thank you so much for your feedback from our first round of revisions last spring. I am hoping that you or someone in your department again will be so kind as to review the proposed changes to these near-final drafts, provide us with further feedback, and, if you are so inclined, provide a letter of support. We are hoping to submit this through the curriculum process this fall, and we would like to propose these changes at our department curriculum committee next week (Nov. 3). If you or another colleague would look at these and provide feedback by then, we would be most appreciative.

I am attaching the Summary of Course Requirement Proposed Changes and each of the 5 program guides that list the courses and suggested course sequence (roadmaps).

I'd like to highlight the changes made from the previous drafts last spring, largely drawn from your gracious feedback:

(1) The life science major will retain an organismal class, but now they have a choice of several.

(2) The chemistry majors will retain both inorganic chemistry and analytical chemistry.

(3) The chemistry majors are all now taking CHEM 20841 in order to fulfill the prerequisite for biochemistry.

(4) Geophysics and geography of soils were substituted because prerequisites could not be met.

(5) Chemistry in our World and 7 Ideas That Shook the Universe were eliminated because of their introductory/non-major nature.

(6) Earth dynamics and/or earth history are being added to most majors to better match the NCATE competencies.

Thank you so much for your help on this matter, and please let me know if you have any questions or concerns. Please feel free to forward this to another colleague if someone else should be given this charge.

Lisa Donnelly, Ph.D.

Assistant Professor of Science Education

Kent State University

Kent, OH 44242

DONNELLY, LISA A.

From: MANLEY, MARK
Sent: Thursday, October 29, 2009 2:03 PM
To: DONNELLY, LISA A.; SAMPSON, PAUL; CARLSON, ROBERT; WELLS, NEIL
Cc: ANDERSON, BRYON
Subject: RE: ADED Science Program Changes

Follow Up Flag: Follow Up
Flag Status: Completed

Dear Lisa,

I have reviewed the documentation you sent and would like to offer the following suggestions/corrections:

1. For the Physical Science Licensure (Grades 7-12), I recommend replacing PHY 32511 Electronics by

PHY 32511 Electronics OR PHY 36002 Applications of Modern Physics.

PHY 36002 is a new 3-hour course that we plan to offer every Fall semester. It is possible that offerings of PHY 32511 Electronics will be reduced in the future due, in part, to decreased enrollments in that course.

A description of PHY 36002 is given below:

PHY 36002 - Applications of Modern Physics Survey of applications of twentieth century physics. Topics include molecular bonding, conducting and insulating solids, degenerate matter, quantum condensates, subatomic and sub-nuclear particle physics, cosmology. Prerequisite: PHY 36001.

PHY 36002 is normally taught from the second half of the textbook used for PHY 36001 so students taking this course would not need to buy an extra textbook. In addition, PHY 36002 is a required course for the Physics Minor. This makes this an attractive choice for your students because they would only need to take PHY 12000 (1 credit) - Introductory Physics Seminar plus an additional 4 hours of physics electives (Electronics, for example) to complete requirements for a Physics Minor.

2. "Meteorology" is misspelled on the Physical Science Licensure sheets.

3. For the Integrated Science Licensure (Grades 7-12), Physics emphasis area, I also suggest replacing PHY 32511 Electronics by

PHY 32511 Electronics OR PHY 36002 Applications of Modern Physics.

Also, PHY 36001 should be listed as "Introductory Modern Physics" NOT as "Modern Physics I".

4. For the Integrated Science Licensure, Physics emphasis ROADMAP, please make the following corrections:

PHY 23101 should be listed as "General University Physics I" (5 credits) PHY 23102 should be listed as "General University Physics II" (5 credits)

The courses listed as PHY 23122 do not exist and should be deleted.

PHY 36001 should be listed as "Introductory Modern Physics" NOT as "Modern Physics I".

On your Overview of Proposed Changes for ADED/MAT Science Majors, a needed correction for the Earth Science area is that

Add PHY 13002 General Physics II (5) should be listed instead as:

Add PHY 13002 General College Physics II (4) Add PHY 13022 General College Physics Lab II (1)

These were all of the items that I noticed. Please let me know if you have any questions or comments. I certainly support the efforts to update all of these science programs.

Best regards,
Mark Manley
Professor and Undergraduate Coordinator

Department of Physics
Kent State University
Kent, OH 44242
Phone: 330-672-2407
E-mail: manley@kent.edu

From: DONNELLY, LISA A.
Sent: Tuesday, October 27, 2009 12:37 PM
To: SAMPSON, PAUL; CARLSON, ROBERT; WELLS, NEIL; MANLEY, MARK
Subject: ADED Science Program Changes

Dear Dr. Sampson, Dr. Carlson, Dr. Wells, and Dr. Manley,

As you know, the ADED faculty are in the process of revising the program requirements for our ADED science majors (earth science, life science, life science/chemistry, physical science, and integrated science with an emphasis in either life science, chemistry, physics, or earth science). We are making revisions to accomplish several goals (reducing overall credit hours as per directive from our associate dean, increasing the NCATE accreditation competencies met by each program, and correcting errors in prerequisites that had existed in the previous programs).

I thank you so much for your feedback from our first round of revisions last spring. I am hoping that you or someone in your department again will be so kind as to review the proposed changes to these near-final drafts, provide us with further feedback, and, if you are so inclined, provide a letter of support. We are hoping to submit this through the curriculum process this fall, and we would like to propose these changes at our department curriculum committee next week (Nov. 3). If you or another colleague would look at these and provide feedback by then, we would be most appreciative.

I am attaching the Summary of Course Requirement Proposed Changes and each of the 5 program guides that list the courses and suggested course sequence (roadmaps).

I'd like to highlight the changes made from the previous drafts last spring, largely drawn from your gracious feedback:

(1) The life science major will retain an organismal class, but now they have a choice of several.

(2) The chemistry majors will retain both inorganic chemistry and analytical chemistry.

(3) The chemistry majors are all now taking CHEM 20841 in order to fulfill the prerequisite for biochemistry.

(4) Geophysics and geography of soils were substituted because prerequisites could not be met.

(5) Chemistry in our World and 7 Ideas That Shook the Universe were eliminated because of their introductory/non-major nature.

(6) Earth dynamics and/or earth history are being added to most majors to better match the NCATE competencies.

Thank you so much for your help on this matter, and please let me know if you have any questions or concerns. Please feel free to forward this to another colleague if someone else should be given this charge.

Lisa Donnelly, Ph.D.

Assistant Professor of Science Education

Kent State University

Kent, OH 44242

DONNELLY, LISA A.

From: SAMPSON, PAUL
Sent: Friday, November 06, 2009 4:58 PM
To: DONNELLY, LISA A.
Cc: SEED, ALEXANDER; TUBERGEN, MICHAEL
Subject: Feedback on Proposed ADED Curriculum
Follow Up Flag: Follow Up
Flag Status: Red

Hi Lisa,

I appreciate the opportunity to review the revised ADED tracks that you sent to us last week and wanted to share with you some feedback. I have listed a few general comments along with some track-specific feedback:

General Comments

The names of the General Chemistry Labs should be modified – they are called *General Chemistry Lab I* CHEM 10062 and *General Chemistry Lab II* 10063.

All programs expect students to take General Chemistry in year 2. This may be problematic for some tracks. For example, General Chemistry I and II are pre-requisites for Cell Biology. Thus, not completing General Chemistry in year 1 will delay Cell Biology for those in life science-oriented tracks. For the Life Science- Chemistry and Integrated Sciences – Chemistry, we would strongly recommend that well-prepared students take General Chemistry in year 1 so as to provide some flexibility in scheduling later chemistry courses. Otherwise, one hiccup later in a chemistry course may well result in a five year degree for the student. Currently, the graduation roadmaps for all science majors call for students to take General Chemistry as freshmen.

Feedback on Specific Tracks

LSCM10 (Life Science – Chemistry)

The Chemistry coverage is close (but not quite) that of a chemistry minor (24 vs 25 ch h). It does include a reasonable breadth with courses in inorganic, analytical, organic and biochemistry. However, it only includes one lab beyond General Chemistry which seems a little thin. While we are gratified to see that you added back crucial courses on inorganic and analytical chemistry after our discussion, we feel that this program is still rather thin on chemistry content coverage for the program which is aimed at preparing chemistry teachers. The program includes 22 h of Biology courses – is the intent that graduates of this program will teach both Biology and Chemistry? If so, then this chemistry/biology balance makes good sense and we appreciate how it might be difficult to add more chemistry content given the pressure to reduce the overall degree credit hours. However if the primary goal is to prepare chemistry teachers, then I would urge more chemistry content, perhaps at the expense of the ecology & evolution courses. The bottom line here – I worry that someone with this level of chemistry preparation (not quite even a minor in chemistry) does not have the depth of appreciation of the field to teach HS chemistry.

ISCI10 (Integrated Science)

The 28 h of chemistry for students who select the chemistry track seems okay, although only 1 cr h of lab beyond General Chemistry seems rather thin. Is an Integrated Science: Life Science graduate expected to teach chemistry? If so, they may find the absence of any courses in inorganic or analytical chemistry to be troublesome, since these areas lie at the heart of HS chemistry.

LFSC10 (Life Science)

The chemistry content of this program seems fine for someone who will teach Biology in HS. (It is too little for someone who will teach chemistry; can we assume that they will not end up as chemistry teachers?)

PHSC10 (Physical Science)

Compared with the other programs, the chemistry content here seems quite good (27 h spread across all sub-disciplines of chemistry). The one caveat: the complete absence of laboratory experiences beyond General Chemistry seems like a serious deficiency.

In the roadmap for this track, CHEM 20481 is listed in Spring of year 2 but is usually taught only in Fall semester.

Overall Feedback

Given your charge to reduce the size of these degree programs by so much, we understand that you cannot include everything that you might like in each track. I appreciate that the deficiencies that I mentioned above have to be couched in this light. That said, I do worry that to graduate the future chemistry teachers of Ohio with the thin content background provided in some of these tracks (typically at a level close to or below that of a chemistry minor) will not position these students well for the effective teaching of HS chemistry. It is difficult to see how a student with only 2-3 cr h of college-level chemistry labs behind them will be expected to set up her/his own lab and work with students in that setting. That said, I do not believe it reasonable to cut chemistry lecture offerings to free up time for such lab experiences. So we are probably left with this less-than-ideal structure, unless other (non-science) courses can be removed to make more room for additional lab content courses.

I would be happy to chat with you about these issues next week and can then draft a letter with some feedback if you like. Please feel free to give me a call (330-672-0034) on Monday, Thursday or Friday.

Have a good weekend.

Best wishes. Paul

KENT STATE UNIVERSITY

Roadmap: Integrated Science - Earth Science - Bachelor of Science in Education

[EH-BSE-ISCI-ESCI]
College of Education, Health and Human Services
School of Teaching, Learning and Curriculum Studies
Catalog Year: 2009-2010

Critical requirements are boldface in shaded areas

Course Subject and Title	Credit Hours	Upper Division	Min. Grade	Important Notes
Semester One: [14 Credit Hours]				
ENG 11011 College Writing I	**3**		**C**	**Fulfills LER Composition**
GEOL 11040 Earth Dynamics	3			Fulfills LER Basic Sciences
GEOL 11041 Earth Dynamics Laboratory	1			Fulfills LER Basic Sciences
MATH 11010 Algebra for Calculus	3			Fulfills LER Mathematics and Critical Reasoning
PSYC 11762 General Psychology	3			Fulfills LER Social Sciences
US 10097 Destination Kent State: FYE	1			Not required of transfer students with 25 credits
Semester Two: [18 Credit Hours]				
Requirement: pass Praxis I Reading (score 175), Writing (score 173) and Mathematics (score 174)				
EDPF 29535 Education in a Democratic Society	**3**		**C**	
COMM 15000 Introduction to Human Communication	3	DELETE		Fulfills LER Additional
GEOL 11042 Earth History	3			
GEOL 11043 Earth History Laboratory	1			
MATH 11022 Trigonometry	2			
SOC 12050 Introduction to Sociology	3			Fulfills LER Social Sciences
LER Fine Arts	3			Visit www.kent.edu/catalog and search "LER" for course lists
Semester Three: [16 Credit Hours]				
Requirement: minimum 2.75 cumulative GPA required by the end of term				
CHEM 10060 General Chemistry I	**4**		**C**	
CHEM 10062 General Chemistry Laboratory I	**1**		**C**	
MATH 12002 Analytic Geometry and Calculus I	**5**		**C**	
ENG 21011 College Writing I	3	Add GEOL 21080 Oceanography (3)		Fulfills LER Composition
PHY 11030 Seven Ideas that Shook the Universe	3			Fulfills LER Basic Sciences
Semester Four: [17 Credit Hours]				
Requirement: apply and be accepted for Advanced Study; minimum 2.75 cumulative GPA				
CHEM 10061 General Chemistry II	**4**		**C**	
CHEM 10063 General Chemistry Laboratory II	**1**		**C**	
EDPF 29525 Educational Psychology	**3**	Change to "Choose ONE from LER Humanities"		
COMM 26000 Criticism of Public Discourse	3			Fulfills LER Humanities
PHIL 11001 Introduction to Philosophy	3			Fulfills LER Humanities and global diversity course requirement
SOC 22778 Social Problems	3	DELETE		Fulfills LER Additional
Semester Five: [17 Credit Hours]				
Requirement: apply for student teaching				
BSCI 10110 Biological Diversity	4		C	
CHEM 20481 Basic Organic Chemistry I	4		C	
GEOL 23063 Mineralogy	4		C	
PHY 13001 General College Physics I	4		C	
PHY 13021 General College Physics Laboratory I	1		C	

15 hr

13 hr

14 hr

Edited Copy ISCI - ESCI

KENT STATE UNIVERSITY

Roadmap: Integrated Science - Earth Science - Bachelor of Science in Education

[EH-BSE-ISCI-ESCI]
College of Education, Health and Human Services
School of Teaching, Learning and Curriculum Studies
Catalog Year: 2009-2010

Course Subject and Title	Credit Hours	Upper Division	Min. Grade	Important Notes
Semester Six: [16 Credit Hours]				
BSCI 10120 Biological Foundations	4		C	
GEOL 31070 Petrology *or* GEOL 32066 Geomorphology	4	■	C	
PHY 13002 General College Physics II	4		C	
PHY 13022 General College Physics Laboratory II	1		C	
SPED 23000 Introduction to Exceptionalities	3		C	Fulfills domestic diversity course requirement
Semester Seven: [15 Credit Hours]				
ADED 32142 Principles of Teaching Adolescents	3	■	C	Fulfills writing-intensive course requirement; offered in fall only
ITEC 19525 Educational Technology	3		C	
CHEM 30105 Analytical Chemistry I DELETE	3	■	C	
CI 47330 Reading and Writing in Adolescence	3	■	C	
GEOG 31062 Fundamentals of Meteorology	3	■	C	
Semester Eight: [16 Credit Hours]				
ADED 32277 Teaching Science in Secondary Schools	3	■	C	
BSCI 30560 Invertebrate Zoology Add BSCI 20140 Cell Biology (4)	4	■	C	
BSCI 30156 Elements of Genetics	3	■	C	
CHEM 30301 Inorganic Chemistry I	3	■	C	
PHY 21430 Frontiers in Astronomy *or* PHY 24001 Astronomy	3		C	
Semester Nine: [16 Credit Hours]				
ADED 42277 Topics in Secondary School Science	3	■	C	
ADED 42292 Field Work Practicum	3	■	C	
GEOG 41082 Geography of Soils DELETE	3	■	C	
GEOL 34061 Invertebrate Paleontology DELETE	4	■	C	
MATH 10041 Elementary Probability and Statistics *or* MATH 30011 Basic Probability and Statistics	3			
Semester Ten: [12 Credit hours]				
ADED 42357 Secondary Student Teaching	9	■	S	
ADED 49525 Inquiry into Professional Practice	3	■	C	

ADD GEOG 41073 Conservation of Natural Resources (3)

Graduation Requirements Summary

Total Hours	Upper-Division Hours	Liberal Education Requirements Hours	Diversity Course Global / Domestic	Writing-Intensive	Minimum Major GPA	Minimum Overall GPA
155 ~~157~~ 143	~~39~~ 42	36	PHIL 11001 / SPED 23000	ADED 32142	2.6	2.75

Special Notes for Degree/Major:

1. Pass Praxis II "Principles of Learning and Teaching" and specialty test.
2. Apply for teaching license (pick up licensure packet in 304 White Hall).

Liberal Education Requirements (LER)
Students must complete a minimum 36 credit hours of Liberal Education Requirements. Colleges or degree programs may specify certain courses to fulfill the requirements. Courses in the students' major field will not count toward the completion of any LER. Honors equivalents shall satisfy the LER. None of the courses on the LER list may be taken with a pass/fail grade.

Diversity Course Requirement
Students must complete a two-course diversity requirement, consisting of one with a domestic focus and one with a global focus. One course must be come from the LER and cannot be in the student's major. The second course may be taken as a second LER; or within a major or minor; or as a general elective; or, with dean's approval, by completing one semester of study in another country.

Writing-Intensive Course Requirement
Students must complete a one-course writing-intensive requirement in their major and earn minimum C (2.00) grade.

Upper-Division Requirement
In general, baccalaureate programs require the successful completion of at least 39 upper-division (numbered 30000 to 49999) credit hours of coursework. Programs in the College of Arts and Sciences require a minimum of 42 hours of upper-division coursework.

KENT STATE UNIVERSITY

Roadmap: Integrated Science - Earth Science - Bachelor of Science in Education

[EH-BSE-ISCI-ESCI]
College of Education, Health, and Human Services
School of Teaching, Learning, and Curriculum Studies
Catalog Year: 2010-2011

Critical requirements are boldface in shaded areas

Course Subject and Title	Credit Hours	Upper Division	Min. Grade	Important Notes
Semester One: [14 Credit Hours]				
US 10097 FYE FLASH Point	1			
MATH 11010 Algebra for Calculus	3			
ENG 11011 College Writing 1	3			
PSYCH 11762 General Psychology	3			
GEOL 11040 Earth Dynamics	3		C	
GEOL 11041 Earth Dynamics Lab	1		C	
Semester Two: [15 Credit Hours]				
MATH 11022 Trigonometry	2			
Fine Art LER	3			
SOC 12050 Intro to Sociology	3			
EDPF 29535 Ed. in a Democratic Society	3		C	
GEOL 10042 Earth History	3		C	
GEOL 10043 Earth History Lab	1		C	
Semester Three: [13 Credit Hours]				
MATH 12002 Analytical Geom. & Calc 1	5			
ENG 21011 College Writing II	3			
CHEM 10060 General Chemistry 1	4		C	
CHEM 10062 Chemistry Lab 1	1		C	
Semester Four: [14 Credit Hours]				
EDPF 29525 Educational Psychology	3		C	
Humanities LER	3			
PHIL 11001 Introduction to Philosophy	3			
CHEM 10061 General Chemistry II	4		C	
CHEM 10063 Chemistry Lab II	1		C	
Semester Five: [17 Credit Hours]				
GEOL 23063 Mineralogy	4		**C**	
PHY 13001 General College Phys I	4		**C**	
PHY 13021 General College Phys I Lab	1		**C**	
BSCI 10120 Bio Foundations	4		C	
CHEM 20481 Basic Organic Chemistry I	4		C	
Semester Six: [16 Credit Hours]				
GEOL 32066/31070 Geomorphology/Petrology	3	•	C	
PHY 13002 General College Phys II	4		C	
PHY 13022 General Coll. Phys II Lab	1		C	
BSCI 10110 Bio Diversity	4		C	

New course sequence ESCI-550

Course Subject and Title	Credit Hours	Upper Division	Min. Grade	Important Notes
SPED 23000 Intro. To Exceptionalities	3		C	
Semester Seven: [15 Credit Hours]				
ITEC 19525 Educational Technology	3		C	
ADED 32142 Princ. Of Teaching Adol.	3	•	C	
C&I 47330 Reading & Writing in ADED	3	•	C	
GEOG 31062 Meteorology	3	•	C	
GEOL 21080 Oceanography	3		C	
Semester Eight: [14 Credit Hours]				
ADED 32277 Teach Science in Sec Sch	3	•	C	
BSCI 30156 Elements of Genetics	3	•	C	
CHEM 30301 Inorganic Chemistry I	2	•	C	
GEOG 41073 Conservation of Nat. Res.	3	•	C	
PHY 21430 Frontiers in Astronomy	3		C	
Semester Nine: [13 Credit Hours]				
ADED 42277 Topics in Sec Sch Science	3	•	C	
ADED 42292 Field Work Practicum	3	•	C	
BSCI 20140 Cell Biology	4		C	
MATH 10041 or 30011 Prob & Stats	3			
Semester Ten: [12 Credit Hours]				
ADED 49525 Inq into Professional Prac	3	•	C	
ADED 42357 Student Teaching	9	•	S	

Graduation Requirements Summary

Minimum Total Hours	Upper-Division Hours	Liberal Education Requirements Hours	Diversity Course Global / Domestic	Writing-Intensive	Minimum Major GPA	Minimum Overall GPA
143	42	36	PHIL 11001/SPED 23000	ADED 32142	2.6	2.75

Note 1: XXXX (X credit hours), choose from the following:

Additional Notes for the XXX program: [IF ANY]

-
-

Liberal Education Requirements (LER)
Students must complete a minimum 36 credit hours of Liberal Education Requirements. Colleges or degree programs may specify certain courses to fulfill the requirements. Courses in the students' major field will not count toward the completion of any LER. Honors equivalents shall satisfy the LER. None of the courses on the LER list may be taken with a pass/fail grade.

Diversity Course Requirement
Students must complete a two-course diversity requirement, consisting of one with a domestic focus and one with a global focus. One course must be come from the LER and cannot be in the student's major. The second course may be taken as a second LER; or within a major or minor; or as a general elective; or, with dean's approval, by completing one semester of study in another country.

Writing-Intensive Course Requirement
Students must complete a one-course writing-intensive requirement in their major and earn minimum C (2.00) grade.

Upper-Division Requirement
In general, baccalaureate programs require the successful completion of at least 39 upper-division (numbered 30000 to 49999) credit hours of coursework. Programs in the College of Arts and Sciences require a minimum of 42 hours of upper-division coursework.

KENT STATE UNIVERSITY
CERTIFICATION OF CURRICULUM PROPOSAL

Preparation Date 27-Oct-09 Curriculum Bulletin _____

Effective Date Fall 2010 Approved by EPC _____

Department	TLC
College	EH - Education, Health and Human Services
Degree	BSE - Bachelor of Science in Education
Program Name	**Integrated Science Bachelor of Science in Education** Program Code **ISCI**
Concentration(s)	Chemistry Concentration(s) Code(s) CHEM
Proposal	Revise Program Requirement

Description of proposal:

The ADED (Adolescent Adult Education) Integrated Science program is a 5-year degree that leads to teaching licensure in all science, grades 7-12. The ADED students (undergraduates) complete the coursework leading to a bachelors degree as well as licensure. This program is subject to the NCATE/NSTA competency standards that are used to guide our program's accreditation.

Proposed Actions:

Delete	COMM 15000 Intro to Human Communication (3)
Delete	SOC 22778 Social Problems (3)
Delete	PHY 11030 7 Ideas that Shook the Universe (3)
Change	COMM 26000 Criticism of Public Discourse (3) to "Choose ONE LER from HUMANITIES" (3)
Change	CHEM 30101 Quantitative Analysis (2) to CHEM 30105 Analytical Chemistry I (3)
Change	CHEM 30360 Aqueous and Descriptive Inorganic (2) to CHEM 30301 Inorganic Chemistry I (2)
Delete	GEOL 21062 Environmental Geology (3)

Does proposed revision change program's total credit hours? ☒ Yes ☐ No

Current total credit hours: 155 Proposed total credit hours 144

Describe impact on other programs, policies or procedures (e.g., encroachment and duplication issues; enrollment and staffing considerations; need; audience; prerequisites; teacher education licensure):

This curriculum proposal outlines changes to the current program. Specific courses have been added and deleted from the program.The proposed changes will accomplish three important goals:
(1) reduce overall credit hours for the program from 155 to 144 to make completion of the degree more manageable (please see associated "roadmaps");
(2) maintain the number of NCATE (accreditation) competencies met from 136/138 (98.6%) to 135/138 (97.8%); and
(3) update the program requirements to reflect changes that have occurred in other college's course offerings (e.g. CHEM 30101 Quantitative Analysis has changed to CHEM 30105 Analytical Chemistry I and CHEM 30360 Aqueous and Descriptive Inorganic has changed to CHEM 30301 Inorganic Chemistry I).

The proposed changes will impact enrollment in courses offered by the following College of Arts and Sciences departments: Communications, Sociology, Physics, Geology, and Chemistry.

Units consulted (other departments, programs or campuses affected by this proposal):

Arts and Sciences faculty from Chemistry were consulted in April 2009, and the Arts and Sciences faculty from Chemistry, Physics, and Geology were consulted again in October 2009.

REQUIRED ENDORSEMENTS

_____	11/12/09
Department Chair / School Director / Campus Dean	
_____	___/___/___
College Dean	
_____	___/___/___
Executive Dean of Regional Campuses / Dean of Graduate Studies	
_____	___/___/___
Senior Vice President for Academic Affairs and Provost	

KENT STATE UNIVERSITY

Roadmap: Integrated Science - Chemistry - Bachelor of Science in Education

[EH-BS-ISCI-CHEM]
College of Education, Health and Human Services
School of Teaching, Learning and Curriculum Studies
Catalog Year: 2009-2010

Critical requirements are boldface in shaded areas

Course Subject and Title	Credit Hours	Upper Division	Min. Grade	Important Notes
Semester One: [13 Credit Hours]				
ENG 11011 College Writing I	3		C	Fulfills LER Composition
MATH 11010 Algebra for Calculus	3			Fulfills LER Mathematics and Critical Reasoning
PHY 11030 Seven Ideas that Shook the Universe	3			Fulfills LER Basic Sciences
PSYC 11762 General Psychology	3			Fulfills LER Social Sciences
US 10097 Destination Kent State: FYE	1			Not required of transfer students with 25 credits
Semester Two: [18 Credit Hours]				
Requirement: successful completion of Praxis I Reading (score 175), Writing (score 173) and Mathematics (score 174)				
BSCI 10110 Biological Diversity	**4**		**C**	
EDPF 29535 Education in a Democratic Society	**3**		**C**	
COMM 15000 Introduction to Human Communication	3	DELETE		Fulfills LER Additional
MATH 11022 Trigonometry	2		C	
SOC 12050 Introduction to Sociology	3			Fulfills LER Social Sciences
LER Fine Arts	3			Visit www.kent.edu/catalog and search "LER" for course lists
Semester Three: [17 Credit Hours]				
Requirement: minimum 2.75 cumulative GPA required by end of term				
BSCI 10120 Biological Foundations	**4**		**C**	
CHEM 10060 General Chemistry I	**4**		**C**	
CHEM 10062 General Chemistry Laboratory I	**1**		**C**	
MATH 12002 Analytical Geometry and Calculus I	**5**			
ENG 21011 College Writing II	3		C	
Semester Four: [17 Credit Hours]				
Requirement: apply and be accepted for Advanced Study by the end of term; minimum 2.75 cumulative GPA				
CHEM 10061 General Chemistry II	**4**		**C**	
CHEM 10063 General Chemistry Laboratory II	**1**		**C**	
EDPF 29525 Educational Psychology	**3**		**C**	
BSCI 30156 Elements of Genetics	3		C	
PHIL 11001 Introduction to Philosophy	3			Fulfills LER Humanities and global diversity course requirement
SOC 22778 Social Problems DELETE	3			
Semester Five: [16 Credit Hours]				
Requirement: apply for student teaching				
BSCI 30140 Cell Biology	4	■	C	
CHEM 20481 Basic Organic Chemistry I	4		C	
CHEM 30475 Organic Chemistry Laboratory	1	■	C	
COMM 26000 Critical of Public Discourse Change to "Course and LER Humanities"	3			Fulfills LER Humanities
GEOL 11040 Earth Dynamics	3			Fulfills LER Basic Sciences
GEOL 11041 Earth Dynamics Laboratory	1			Fulfills LER Basic Sciences Laboratory

Edited Copy ISCI-CHEM

KENT STATE UNIVERSITY

Roadmap: Integrated Science - Chemistry - Bachelor of Science in Education

[EH-BS-ISCI-CHEM]
College of Education, Health and Human Services
School of Teaching, Learning and Curriculum Studies
Catalog Year: 2009-2010

Course Subject and Title	Credit Hours	Upper Division	Min. Grade	Important Notes
Semester Six: [16 Credit Hours]				
CHEM 30284 Introduction to Biological Chemistry	4	■	C	
CHEM 30301 Inorganic Chemistry I	2	■	C	
GEOL 11042 Earth History	3		C	
GEOL 11043 Earth History Laboratory	1		C	
PHY 21430 Frontiers in Astronomy *or* PHY 24001 Astronomy	3		C	
SPED 23000 Introduction to Exceptionalities	3		C	Fulfills domestic diversity course requirement
Semester Seven: [17 Credit Hours]				
ADED 32142 Principles of Teaching Adolescents	**3**	**■**	**C**	**Fulfills writing-intensive requirement; offered in fall only**
ITEC 19525 Educational Technology	**3**		**C**	
CI 47330 Reading and Writing in Adolescence	3	■	C	
GEOG 31062 Fundamentals of Meteorology	3	■	C	
PHY 13001 General College Physics I	4		C	
PHY 13021 General College Physics Laboratory I	1		C	
Semester Eight: [14 Credit Hours]				
ADED 32277 Teaching Science in Secondary Schools	**3**	**■**	**C**	**Offered in spring only**
GEOG 41073 Conservation of Natural Resources	3	■	C	
GEOL 21062 Environmental Geology DELETE	3		C	
PHY 13002 General College Physics II	4		C	
PHY 13022 General College Physics Laboratory II	1		C	
Semester Nine: [16 Credit Hours]				
ADED 42277 Topics in Secondary School Science	**3**	**■**	**C**	
ADED 42292 Field Work Practicum	**3**	**■**	**C**	
CHEM 30105 Analytical Chemistry I	3	■		
CHEM 40567 Basic Concepts of Physical Chemistry	4	■		
MATH 10041 Elementary Probability and Statistics *or* MATH 30011 Basic Probability and Statistics	3			
Semester Ten: [12 Credit Hours]				
ADED 42357 Secondary Student Teaching	**9**	**■**	**S**	
ADED 49525 Inquiry into Professional Practice	**3**	**■**	**C**	

Graduation Requirements Summary

Total Hours	Upper-Division Hours	Liberal Education Requirements Hours	Diversity Course Global / Domestic	Writing-Intensive	Minimum Major GPA	Minimum Overall GPA
144	50	36	PHIL 11001/ SPED 23000	ADED 32142	2.6	2.75

Notes on Licensure:

1. Complete Praxis II "Principles of Learning and Teaching grades 7-12" (passing score 165) and Praxis II specialty test.
2. Apply for teaching license (pick up licensure packet in 304 White Hall).

Liberal Education Requirements (LER)

Students must complete a minimum 36 credit hours of Liberal Education Requirements. Colleges or degree programs may specify certain courses to fulfill the requirements. Courses in the students' major field will not count toward the completion of any LER. Honors equivalents shall satisfy the LER. None of the courses on the LER list may be taken with a pass/fail grade.

Diversity Course Requirement

Students must complete a two-course diversity requirement, consisting of one with a domestic focus and one with a global focus. One course must be come from the LER and cannot be in the student's major. The second course may be taken as a second LER; or within a major or minor; or as a general elective; or, with dean's approval, by completing one semester of study in another country.

Writing-Intensive Course Requirement

Students must complete a one-course writing-intensive requirement in their major and earn minimum C (2.00) grade.

Upper-Division Requirement

In general, baccalaureate programs require the successful completion of at least 39 upper-division (numbered 30000 to 49999) credit hours of coursework. Programs in the College of Arts and Sciences require a minimum of 42 hours of upper-division coursework.

KENT STATE UNIVERSITY

Roadmap: Integrated Science - Chemistry - Bachelor of Science in Education

[EH-BSE-ISCI-CHEM]
College of Education, Health, and Human Services
School of Teaching, Learning, and Curriculum Studies
Catalog Year: 2010-2011

Critical requirements are boldface in shaded areas

Course Subject and Title	Credit Hours	Upper Division	Min. Grade	Important Notes
Semester One: [14 Credit Hours]				
US 10097 FYE FLASH Point	1			
MATH 11010 Algebra for Calculus	3			
BSCI 10120 Bio Foundations	4			
ENG 11011 College Writing 1	3			
PSYCH 11762 General Psychology	3			
Semester Two: [15 Credit Hours]				
MATH 11022 Trigonometry	2			
Fine Art LER	3			
SOC 12050 Intro to Sociology	3			
BSCI 10110 Bio Diversity	4		C	
EDPF 29535 Ed. in a Democratic Society	3		C	
Semester Three: [13 Credit Hours]				
MATH 12002 Analytical Geom. & Calc 1	5			
ENG 21011 College Writing II	3			
CHEM 10060 General Chemistry 1	4		C	
CHEM 10062 Chemistry Lab 1	1		C	
Semester Four: [14 Credit Hours]				
EDPF 29525 Educational Psychology	3		C	
BSCI 30156 Elements of Genetics	3	•	C	
PHIL 11001 Introduction to Philosophy	3			
CHEM 10061 General Chemistry II	4		C	
CHEM 10063 Chemistry Lab II	1		C	
Semester Five: [16 Credit Hours]				
GEOL 11040 Earth Dynamics	3		C	
GEOL 11041 Earth Dynamics Lab	1		C	
CHEM 20481 Basic Organic Chemistry I	4		C	
CHEM 30475 Organic Chem Lab	1	•	C	
BSCI 20140 Cell Biology	4		C	
Humanities LER	3			
Semester Six: [16 Credit Hours]				
GEOL 10042 Earth History	3		C	
GEOL 10043 Earth History Lab	1		C	
CHEM 30284 Intro Biochemistry	4	•	C	
CHEM 30301 Inorganic Chemistry I	2	•	C	
PHY 21430 Frontiers in Astronomy	3		C	

New Course Sequence ISCI-CHEM

KENT STATE UNIVERSITY

Roadmap: Integrated Science - Chemistry - Bachelor of Science in Education
[EH-BSE-ISCI-CHEM]
College of Education, Health, and Human Services
School of Teaching, Learning, and Curriculum Studies
Catalog Year: 2010-2011

Course Subject and Title	Credit Hours	Upper Division	Min. Grade	Important Notes
SPED 23000 Intro. to Exceptionalities	3		C	
Semester Seven: [14 Credit Hours]				
ITEC 19525 Educational Technology	3		C	
ADED 32142 Princ. Of Teaching Adol.	3	•	C	
CHEM 30105 Analytical Chemistry	3	•	C	
PHY 13001 General College Phys I	4		C	
PHY 13021 General College Phys I Lab	1		C	
Semester Eight: [14 Credit Hours]				
ADED 32277 Teach Science in Sec Sch	3	•	C	
GEOG 41073 Conservation of Nat. Res.	3	•	C	
PHY 13002 General College Phys II	4		C	
PHY 13022 General Coll. Phys II Lab	1		C	
C&I 47330 Reading & Writing in ADED	3	•	C	
Semester Nine: [16 Credit Hours]				
ADED 42277 Topics in Sec Sch Science	3	•	C	
ADED 42292 Field Work Practicum	3	•	C	
GEOG 31062 Meteorology	3	•	C	
CHEM 40567 Basic Conc. of Phys Chem	4	•	C	
MATH 10041 or 30011 Prob & Stats	3			
Semester Ten: [12 Credit Hours]				
ADED 49525 Inq into Professional Prac	3	•	C	
ADED 42357 Student Teaching	9	•	S	

Graduation Requirements Summary

Minimum Total Hours	Upper-Division Hours	Liberal Education Requirements Hours	Diversity Course Global / Domestic	Writing-Intensive	Minimum Major GPA	Minimum Overall GPA
144	50	36	PHIL 11001/SPED 23000	ADED 32142	2.6	2.75

Note 1: XXXX (X credit hours), choose from the following:

Additional Notes for the XXX program: [IF ANY]

-
-

Liberal Education Requirements (LER)
Students must complete a minimum 36 credit hours of Liberal Education Requirements. Colleges or degree programs may specify certain courses to fulfill the requirements. Courses in the students' major field will not count toward the completion of any LER. Honors equivalents shall satisfy the LER. None of the courses on the LER list may be taken with a pass/fail grade.

Diversity Course Requirement
Students must complete a two-course diversity requirement, consisting of one with a domestic focus and one with a global focus. One course must be come from the LER and cannot be in the student's major. The second course may be taken as a second LER; or within a major or minor; or as a general elective; or, with dean's approval, by completing one semester of study in another country.

Writing-Intensive Course Requirement
Students must complete a one-course writing-intensive requirement in their major and earn minimum C (2.00) grade.

Upper-Division Requirement
In general, baccalaureate programs require the successful completion of at least 39 upper-division (numbered 30000 to 49999) credit hours of coursework. Programs in the College of Arts and Sciences require a minimum of 42 hours of upper-division coursework.

KENT STATE UNIVERSITY
CERTIFICATION OF CURRICULUM PROPOSAL

Preparation Date 27-Oct-09 Curriculum Bulletin _____

Effective Date Fall 2010 Approved by EPC _____

Department	TLC
College	EH - Education, Health and Human Services
Degree	BSE - Bachelor of Science in Education
Program Name	**Integrated Science Bachelor of Science in Education** Program Code **ISCI**
Concentration(s)	Life Science Concentration(s) Code(s) LFSC
Proposal	Revise Program Requirement

Description of proposal:

The ADED (Adolescent Adult Education) Integrated Science program is a 5-year degree that leads to teaching licensure in all science, grades 7-12. The ADED students (undergraduates) complete the coursework leading to a bachelors degree as well as licensure. This program is subject to the NCATE/NSTA competency standards that are used to guide our program's accreditation.

Proposed Actions:

Delete	COMM 15000 Intro to Human Communication (3)
Delete	SOC 22778 Social Problems (3)
Delete	GEOL 34061 Invertebrate Paleontology (4)
Delete	BSCI 30030 Human Physiology; BSCI 40430 General Physiology (4)
Delete	PHY 11030 7 Ideas that Shook the Universe (3)
Change	COMM 26000 Criticism of Public Discourse (3) to "Choose ONE LER from HUMANITIES" (3)
Add	GEOL 21062 Environmental Geology (3)

Does proposed revision change program's total credit hours? ☒ Yes ☐ No

Current total credit hours: 158 Proposed total credit hours 144

Describe impact on other programs, policies or procedures (e.g., encroachment and duplication issues; enrollment and staffing considerations; need; audience; prerequisites; teacher education licensure):

This curriculum proposal outlines changes to the current program. Specific courses have been added and deleted from the program.The proposed changes will accomplish two important goals:
(1) reduce overall credit hours for the program from 158 to 144 to make completion of the degree more manageable (please see associated "roadmaps"); and
(2) increase or maintain the number of NCATE (accreditation) competencies met from 122/133 (96.2%) to 129/133 (97.0%).

The proposed changes will impact enrollment in courses offered by the following College of Arts and Sciences departments: Communications, Sociology, Physics, Geology, Chemistry, and Biology.

Units consulted (other departments, programs or campuses affected by this proposal):

Arts and Sciences faculty from Biology and Chemistry were consulted in April 2009, and Arts and Sciences faculty from Biology, Chemistry, Physics, and Geology were consulted again in October 2009.

REQUIRED ENDORSEMENTS

Alyce L Anderson 11/12/09

Department Chair / School Director / Campus Dean

College Dean ____/____/____

Executive Dean of Regional Campuses / Dean of Graduate Studies ____/____/____

Senior Vice President for Academic Affairs and Provost ____/____/____

KENT STATE UNIVERSITY

Roadmap: Integrated Science - Life Science - Bachelor of Science in Education

[EH-BSE-ISCI-LFSC]
College of Education, Health and Human Services
School of Teaching, Learning and Curriculum Studies
Catalog Year: 2009-2010

Critical requirements are boldface in shaded areas

Course Subject and Title	Credit Hours	Upper Division	Min. Grade	Important Notes
Semester One: [13 Credit Hours]				
ENG 11011 College Writing I	3		C	Fulfills LER Composition
MATH 11010 Algebra for Calculus	3			Fulfills LER Mathematics and Critical Reasoning
PHY 11030 Seven Ideas that Shook the Universe	3	DELETE		Fulfills LER Basic Sciences
PSYC 11762 General Psychology	3			Fulfills LER Social Sciences
US 10097 Destination Kent State: FYE	1			Not required of transfer students with 25 credits
Semester Two: [18 Credit Hours]				
Requirement: pass Praxis I Reading (score 175), Writing (score 173) and Mathematics (score 174)				
BSCI 10110 Biological Diversity	**4**		**C**	
EDPF 29535 Education in a Democratic Society	**3**		**C**	
COMM 15000 Introduction to Human Communication	3	DELETE		Fulfills LER Additional
MATH 11022 Trigonometry	2		C	
SOC 12050 Introduction to Sociology	3			Fulfills LER Social Sciences
LER Fine Arts	3			Visit www.kent.edu/catalog and search "LER" for course lists
Semester Three: [17 Credit Hours]				
Requirement: minimum 2.75 cumulative GPA required by end of term				
BSCI 10120 Biological Foundations	**4**		**C**	
CHEM 10060 General Chemistry I	**4**		**C**	
CHEM 10062 General Chemistry Laboratory I	**1**		**C**	
MATH 12002 Analytical Geometry and Calculus I	**5**		**C**	
ENG 21011 College Writing II	3		C	
Semester Four: [17 Credit Hours]				
Requirement: apply and be accepted for Advanced Study by the end of term; 2.75 cumulative GPA				
CHEM 10061 General Chemistry II	**4**		**C**	
CHEM 10063 General Chemistry Laboratory II	**1**		**C**	
EDPF 29525 Educational Psychology	**3**		**C**	
BSCI 30156 Elements of Genetics	3	■	C	
PHIL 11001 Introduction to Philosophy	3			Fulfills LER Humanities and global diversity course requirement
SOC 22778 Social Problems DELETE	3			Fulfills LER Additional
Semester Five: [16 Credit Hours]				
Requirement: apply for student teaching				
BSCI 30140 Cell Biology	4	■	C	
CHEM 20481 Basic Organic Chemistry I	4		C	
COMM 26000 Criticism of Public Discourse Change to "choose 1 LER from Humanities"	3		C	Fulfills LER Humanities
PHY 13001 General College Physics I	4		C	
PHY 13021 General College Physics I Laboratory	1		C	

Add GEOL 21062 Environmental Geology (3)

Edited Roadmap ISCI - LFSC

KENT STATE UNIVERSITY

Roadmap: Integrated Science - Life Science - Bachelor of Science in Education
[EH-BSE-ISCI-LFSC]
College of Education, Health and Human Services
School of Teaching, Learning and Curriculum Studies
Catalog Year: 2009-2010

Course Subject and Title	Credit Hours	Upper Division	Min. Grade	Important Notes
Semester Six: [16 Credit Hours]				
BSCI 30030 Human Physiology *or* BSCI 40430 General Physiology DELETE	4	■	C	
CHEM 30284 Introduction to Biological Chemistry	4	■	C	
PHY 13002 General College Physics II	4		C	
PHY 13022 General College Physics II Laboratory	1		C	
SPED 23000 Introduction to Exceptionalities	3		C	Fulfills domestic diversity course requirement
Semester Seven: [16 Credit Hours]				
ADED 32142 Principles of Teaching Adolescents	**3**	■	**C**	**Fulfills writing-intensive course requirement, offered in fall only**
ITEC 19525 Educational Technology	**3**		**C**	
CI 47330 Reading and Writing in Adolescence	3	■	C	
GEOG 31062 Fundamentals of Meteorology	3	■	C	
GEOL 11040 Earth Dynamics	3			Fulfills LER Basic Sciences
GEOL 11041 Earth Dynamics Laboratory	1			
Semester Eight: [17 Credit Hours]				
ADED32277 Teaching Science in Secondary Schools	**3**	■	**C**	
BSCI 30360 General Ecology	4	■	C	
BSCI 40163 Organic Evolution	3	■	C	
GEOG 41073 Conservation of Natural Resources	3	■	C	
GEOL 11042 Earth History	3		C	
GEOL 11043 Earth History Laboratory	1		C	
Semester Nine: [16 Credit Hours]				
ADED 42277 Topics in Secondary School Science	**3**	■	**C**	
ADED 42292 Field Work Practicum	**3**	■	**C**	
GEOL 34061 Invertebrate Paleontology DELETE	4	■	C	Fulfills writing-intensive course requirement
MATH 10041 Elementary Probability and Statistics *or* MATH 30011 Basic Probability and Statistics	3			
PHY 21430 Frontiers in Astronomy *or* PHY 24001 Astronomy	3			
Semester Ten: [12 Credit Hours]				
ADED 42357 Secondary Student Teaching	**9**	■	**S**	**Offered in spring only**
ADED 49525 Inquiry into Professional Practice	**3**	■	**C**	

Graduation Requirements Summary

Total Hours	Upper-Division Hours	Liberal Education Requirements Hours	Diversity Course Global / Domestic	Writing-Intensive	Minimum Major GPA	Minimum Overall GPA
~~120~~ 144	~~39~~ 47	36	PHIL 11001 / SPED 23000	ADED32142	2.6	2.75

Special Notes for Degree/Major:

1. Pass Praxis II "Principles of Learning and Teaching" and specialty test.
2. Apply for teaching license (pick up licensure packet in 304 White Hall).

Liberal Education Requirements (LER)
Students must complete a minimum 36 credit hours of Liberal Education Requirements. Colleges or degree programs may specify certain courses to fulfill the requirements. Courses in the students' major field will not count toward the completion of any LER. Honors equivalents shall satisfy the LER. None of the courses on the LER list may be taken with a pass/fail grade.

Diversity Course Requirement
Students must complete a two-course diversity requirement, consisting of one with a domestic focus and one with a global focus. One course must be come from the LER and cannot be in the student's major. The second course may be taken as a second LER; or within a major or minor; or as a general elective; or, with dean's approval, by completing one semester of study in another country.

Writing-Intensive Course Requirement
Students must complete a one-course writing-intensive requirement in their major and earn minimum C (2.00) grade.

Upper-Division Requirement
In general, baccalaureate programs require the successful completion of at least 39 upper-division (numbered 30000 to 49999) credit hours of coursework. Programs in the College of Arts and Sciences require a minimum of 42 hours of upper-division coursework.

KENT STATE UNIVERSITY

Roadmap: Integrated Science - Life Science - Bachelor of Science in Education

[EH-BSE-ISCI-LFSC]
College of Education, Health, and Human Services
School of Teaching, Learning, and Curriculum Studies
Catalog Year: 2010-2011

Critical requirements are boldface in shaded areas

Course Subject and Title	Credit Hours	Upper Division	Min. Grade	Important Notes
Semester One: [14 Credit Hours]				
US 10097 FYE FLASH Point	1			
MATH 11010 Algebra for Calculus	3			
ENG 11011 College Writing 1	3			
PSYCH 11762 General Psychology	3			
BSCI 10120 Bio Foundations	4		C	
Semester Two: [15 Credit Hours]				
MATH 11022 Trigonometry	2			
Fine Art LER	3			
SOC 12050 Intro to Sociology	3			
BSCI 10110 Bio Diversity	4		C	
EDPF 29535 Ed. in a Democratic Society	3		C	
Semester Three: [16 Credit Hours]				
MATH 12002 Analytical Geom. & Calc 1	5			
ENG 21011 College Writing II	3			
CHEM 10060 General Chemistry 1	4		C	
CHEM 10062 Chemistry Lab 1	1		C	
PHIL 11001 Introduction to Philosophy	3			
Semester Four: [14 Credit Hours]				
EDPF 29525 Educational Psychology	3		C	
BSCI 30156 Elements of Genetics	3	•	C	
CHEM 10061 General Chemistry II	4		C	
CHEM 10063 Chemistry Lab II	1		C	
SPED 23000 Intro. to Exceptionalities	3		C	
Semester Five: [15 Credit Hours]				
GEOL 11040 Earth Dynamics	3		**C**	
GEOL 11041 Earth Dynamics Lab	3		**C**	
BSCI 20140 Cell Biology	4		**C**	
Humanities LER	3			
CHEM 20481 Basic Organic Chemistry I	4		C	
Semester Six: [15 Credit Hours]				
GEOL 10042 Earth History	3		C	
GEOL 10043 Earth History Lab	1		C	
GEOG 41073 Conservation of Nat. Res.	3	•	C	
CHEM 30284 Intro Biochemistry	4	•	C	
BSCI 30360 General Ecology	4	•	C	

New course sequence ISCI - LFSC

KENT STATE UNIVERSITY

Roadmap: Integrated Science - Life Science - Bachelor of Science in Education
[EH-BSE-ISCI-LFSC]
College of Education, Health, and Human Services
School of Teaching, Learning, and Curriculum Studies
Catalog Year: 2010-2011

Course Subject and Title	Credit Hours	Upper Division	Min. Grade	Important Notes
Semester Seven: [14 Credit Hours]				
ADED 32142 Princ. Of Teaching Adol.	3	•	C	
C&I 47330 Reading & Writing in ADED	3	•	C	
ITEC 19525 Educational Technology	3		C	
PHY 13001 General College Phys I	4		C	
PHY 13021 General College Phys I Lab	1		C	
Semester Eight: [14 Credit Hours]				
ADED 32277 Teach Science in Sec Sch	3	•	C	
BSCI 40163 Organic Evolution	3	•	C	
GEOL 21062 Environmental Geology	3		C	
PHY 13002 General College Phys II	4		C	
PHY 13022 General Coll. Phys II Lab	1		C	
Semester Nine: [15 Credit Hours]				
ADED 42277 Topics in Sec Sch Science	3	•	C	
ADED 42292 Field Work Practicum	3	•	C	
PHY 21430 Frontiers in Astronomy	3		C	
MATH 10041 or 30011 Prob & Stats	3			
GEOG 31062 Meteorology	3	•	C	
Semester Ten: [12 Credit Hours]				
ADED 49525 Inq into Professional Prac	3	•	C	
ADED 42357 Student Teaching	9	•	S	

Graduation Requirements Summary

Minimum Total Hours	Upper-Division Hours	Liberal Education Requirements Hours	Diversity Course Global / Domestic	Writing-Intensive	Minimum Major GPA	Minimum Overall GPA
144	47	36	PHIL 11001/SPED 23000	ADED 32142	2.6	2.75

Note 1: XXXX (X credit hours), choose from the following:

Additional Notes for the XXX program: [IF ANY]

-
-

Liberal Education Requirements (LER)
Students must complete a minimum 36 credit hours of Liberal Education Requirements. Colleges or degree programs may specify certain courses to fulfill the requirements. Courses in the students' major field will not count toward the completion of any LER. Honors equivalents shall satisfy the LER. None of the courses on the LER list may be taken with a pass/fail grade.

Diversity Course Requirement
Students must complete a two-course diversity requirement, consisting of one with a domestic focus and one with a global focus. One course must be come from the LER and cannot be in the student's major. The second course may be taken as a second LER; or within a major or minor; or as a general elective; or, with dean's approval, by completing one semester of study in another country.

Writing-Intensive Course Requirement
Students must complete a one-course writing-intensive requirement in their major and earn minimum C (2.00) grade.

Upper-Division Requirement
In general, baccalaureate programs require the successful completion of at least 39 upper-division (numbered 30000 to 49999) credit hours of coursework. Programs in the College of Arts and Sciences require a minimum of 42 hours of upper-division coursework.

KENT STATE UNIVERSITY
CERTIFICATION OF CURRICULUM PROPOSAL

Preparation Date 27-Oct-09 Curriculum Bulletin _____

Effective Date Fall 2010 Approved by EPC _____

Department	TLC
College	EH - Education, Health and Human Services
Degree	BSE - Bachelor of Science in Education
Program Name	**Life Science/Chemistry Bachelor of Science in Education** Program Code **LSCM**
Concentration(s)	Concentration(s) Code(s)
Proposal	Revise Program Requirement

Description of proposal:

The ADED (Adolescent Adult Education) Life Science/Chemistry program leads to teaching licensure in life sciences as well as chemistry. The ADED students (undergraduates) complete the coursework leading to a bachelors degree as well as licensure. This program is subject to the NCATE/NSTA competency standards that are used to guide our program's accreditation.

Proposed Actions:

Delete	COMM 15000 Intro to Human Communication (3)
Delete	SOC 22778 Social Problems (3)
Delete	GEOL 34061 Invertebrate Paleontology (4)
Delete	BSCI 30030 Human Physiology; BSCI 40430 General Physiology (4)
Change	COMM 26000 Criticism of Public Discourse (3) to "Choose ONE LER from HUMANITIES" (3)
Change	CHEM 30101 Quantitative Analysis (2) to CHEM 30105 Analytical Chemistry I (3)
Change	CHEM 30360 Aqueous and Descriptive Inorganic (2) to CHEM 30301 Inorganic Chem I (2)
Change	CHEM 30481 Organic Chemistry I (3) to CHEM 20481 Basic Organic Chemistry (4)
Add	GEOL 10040 Earth Dynamics (3)
Add	GEOL 10041 Earth Dynamics Lab (1)

Does proposed revision change program's total credit hours? ☒ Yes ☐ No

Current total credit hours: 142 Proposed total credit hours 134

Describe impact on other programs, policies or procedures (e.g., encroachment and duplication issues; enrollment and staffing considerations; need; audience; prerequisites; teacher education licensure):

This curriculum proposal outlines changes to the current program. Specific courses have been added and deleted from the program.The proposed changes will accomplish four important goals:
(1) reduce overall credit hours for the program from 142 to 134, as per directive from Associate Dean in order for the program to fit within a four-year timeframe (please see associated "roadmaps");
(2) increase or maintain the number of NCATE (accreditation) competencies met from 73.5/88 (83.5%) to 79/88 (89.8%); and
(3) correct prerequisite errors by either including appropriate prerequisites or deleting courses for which prerequisites could not be met (e.g. CHEM 30481 Organic Chemistry I (3) to CHEM 20481 Basic Organic Chemistry (4) to correct missing prerequisite); and
(4) update the program requirements to reflect changes that have occurred in other college's course offerings (e.g. CHEM 30101 Quantitative Analysis has changed to CHEM 30105 Analytical Chemistry I and CHEM 30360 Aqueous and Descriptive Inorganic has changed to CHEM 30301 Inorganic Chemistry I).

The proposed changes will impact enrollment in courses offered by the following College of Arts and Sciences departments: Communications, Sociology, Geology, Biology, and Chemistry.

Units consulted (other departments, programs or campuses affected by this proposal):

Arts and Sciences faculty from Biology and Chemistry were consulted in April 2009, and Arts and Sciences faculty from Biology, Chemistry, Physics, and Geology were consulted again in October 2009.

REQUIRED ENDORSEMENTS

[signature]	11/12/09
Department Chair / School Director / Campus Dean	
	___/___/___
College Dean	
	___/___/___
Executive Dean of Regional Campuses / Dean of Graduate Studies	
	___/___/___
Senior Vice President for Academic Affairs and Provost	

KENT STATE UNIVERSITY

Roadmap: Life Science - Chemistry - Bachelor Science in Education
[EH-BSE-LSCM]
College of Education Health and Human Services
School of Teaching, Learning and Curriculum Studies
Catalog Year: 2009-2010

Critical requirements are boldface in shaded areas

Course Subject and Title	Credit Hours	Upper Division	Min. Grade	Important Notes
Semester One: [14 Credit Hours]				
BSCI 10110 Biological Diversity	**4**		**C**	
ENG 11011 College Writing I	**3**		**C**	**Fulfills LER Composition**
MATH 11010 Algebra for Calculus	3			Course may be waived based on placement; fulfills LER Mathematics and Critical Reasoning
PSYC 11762 General Psychology	3			Fulfills LER Social Sciences
US 10097 Destination Kent State: FYE	1			Not required of transfer student with 25 credits
Semester Two: [15 Credit Hours]				
Requirement: successful completion of Praxis I in Reading (175 score), Writing (173 score) and Mathematics (174 score)				
BSCI 10120 Biological Foundations	**4**		**C**	
EDPF 29535 Education in Democratic Society	**3**		**C**	
COMM 26000 Critical of Public Discourse	3			Fulfills LER Humanities
MATH 11022 Trigonometry	2		C	Course may be waived based on placement
SOC 12050 Introduction to Sociology	3			Fulfills LER Social Sciences
Semester Three: [17 Credit Hours]				
Requirement: minimum 2.75 cumulative GPA by end of term				
CHEM 10060 General Chemistry I	**4**			
CHEM 10062 General Chemistry I Laboratory	**1**			
ENG 21011 College Writing II	**3**		**C**	**Fulfills LER Composition**
MATH 12002 Analytical Geometry and Calculus I	**5**			
BSCI 30140 Cell Biology	4		C	
Semester Four: [16 Credit Hours]				
Requirement: apply for an be accepted to Advanced Study by end of term; minimum 2.75 cumulative GPA				
CHEM 10061 General Chemistry II	**4**		**C**	
CHEM 10063 General Chemistry II Laboratory	**1**		**C**	
EDPF 29525 Educational Psychology	**3**		**C**	
BSCI 30156 Elements of Genetics	3		C	
PHY 13001 General College Physics I	4			Fulfills LER Basic Sciences
PHY 13021 General College Physics I Laboratory	1			
Semester Five: [18 Credit Hours]				
Requirement: apply for student teaching				
ADED 32142 Principles of Teaching Adolescents	**3**		**C**	**Fulfills writing-intensive course requirement; Offered in fall only**
ITEC 19525 Educational Technology	**3**		**C**	
CHEM 30475 Organic Chemistry Laboratory	1		C	
CHEM 30481 Organic Chemistry I	4		C	
CI 47330 Reading and Writing in Adolescence/Adulthood	3		C	
PHY 13002 General College Physics II	1			Fulfills LER Basic Sciences
PHY 13022 General College Physics II Laboratory	1			

Edited Copy BSE-LSCM

KENT STATE UNIVERSITY

Roadmap: Life Science - Chemistry - Bachelor Science in Education
[EH-BSE-LSCM]
College of Education Health and Human Services
School of Teaching, Learning and Curriculum Studies
Catalog Year: 2009-2010

Semester Six: [16 Credit Hours]				
ADED 32277 Teaching Science in Secondary Schools	3		C	Offered in spring only
BSCI 30360 General Ecology	4		C	
BSCI 40163 Organic Evolution	3		C	
CHEM 30284 Introduction to Biological Chemistry	4		C	
CHEM 30301 Inorganic Chemistry I	2		C	
Semester Seven: [17 Credit Hours]				
ADED 42277 Topics in Secondary Schools Science	3		C	
ADED 42292 Field Work Practicum	3			
BSCI 30030 Human Physiology *or* BSCI 40430 Animal Physiology Add GEOL 10040 Earth Dynamics (3) and GEOL 10041 Earth Dynamics Lab (1)	4			
CHEM 30105 Analytical Chemistry I	3			
GEOL 34061 Invertebrate Paleontology DELETE	4			
Semester Eight: [12 Credit Hours]				
ADED 42357 Student Teaching	9		S	
ADED 49525 Inquiry into Professional Practice	3		C	
Semester Nine: [18 Credit Hours]				
Any or all courses may be taken during undergraduate summer semester(s)				
COMM 15000 Introduction to human Communications DELETE	3			Fulfills LER Additional
MATH 10041 Elementary Probability and Statistics *or* MATH 30011 Basic Probability and Statistics	3			
PHIL 11001 Introduction to Philosophy	3			Fulfills LER Humanities and global diversity course requirement
SOC 22778 Social Problems DELETE	3			Fulfills LER Additional
SPED 23000 Introduction to Exceptionalities	3		C	Fulfills domestic Diversity course requirement
LER Fine Arts	3			Visit www.kent.edu/catalog and search "LER" for course list

Graduation Requirements Summary

Minimum Total Hours	Upper-Division Hours	Liberal Education Requirements Hours	Diversity Course Global / Domestic	Writing-Intensive	Minimum Major GPA	Minimum Overall GPA
143 134	39 45	36	PHIL 11001 / SPED 23000	ADED 32142	2.6	2.75

Notes on Licensure:

1. Complete Praxis II "Principles of Learning and Teaching grades 7-12" (passing score 165) and Praxis II specialty test.
2. Apply for teaching license (pick up licensure packet in 304 White Hall).

Liberal Education Requirements (LER)
Students must complete a minimum 36 credit hours of Liberal Education Requirements. Colleges or degree programs may specify certain courses to fulfill the requirements. Courses in the students' major field will not count toward the completion of any LER. Honors equivalents shall satisfy the LER. None of the courses on the LER list may be taken with a pass/fail grade.

Diversity Course Requirement
Students must complete a two-course diversity requirement, consisting of one with a domestic focus and one with a global focus. One course must be come from the LER and cannot be in the student's major. The second course may be taken as a second LER; or within a major or minor; or as a general elective; or, with dean's approval, by completing one semester of study in another country.

Writing-Intensive Course Requirement
Students must complete a one-course writing-intensive requirement in their major and earn minimum C (2.00) grade.

Upper-Division Requirement
In general, baccalaureate programs require the successful completion of at least 39 upper-division (numbered 30000 to 49999) credit hours of coursework. Programs in the College of Arts and Sciences require a minimum of 42 hours of upper-division coursework.

KENT STATE UNIVERSITY

Roadmap: Life Science - Chemistry -Bachelor of Science in Education

[EH-BSE-LSCM]
College of Education, Health, and Human Services
School of Teaching, Learning, and Curriculum Studies
Catalog Year: 2010-2011

Critical requirements are boldface in shaded areas

Course Subject and Title	Credit Hours	Upper Division	Min. Grade	Important Notes
Semester One: [17 Credit Hours]				
US 10097 FYE FLASH Point	1		C	
MATH 11010 Algebra for Calculus	3		C	
BSCI 10110 Bio Diversity	4		C	
ENG 11011 College Writing 1	3		C	
PSYCH 11762 General Psychology	3		C	
PHIL 11001 Intro to Philosophy	3		C	
Semester Two: [18 Credit Hours]				
MATH 11022 Trigonometry	2		C	
BSCI 10120 Bio Foundations	4		C	
SOC 12050 Intro to Sociology	3		C	
Humanities LER	3		C	
EDPF 29535 Ed. in a Democratic Society	3		C	
Fine Art LER	3			
Semester Three: [17 Credit Hours]				
MATH 12002 Analytical Geom. & Calc 1	5			
ENG 21011 College Writing II	3			
GEOL 10040 Earth Dynamics	3		C	
GEOL 10041 Earth Dynamics Lab	1		C	
CHEM 10060 General Chemistry 1	4		C	
CHEM 10062 General Chemistry Lab 1	1		C	
Semester Four: [16 Credit Hours]				
EDPF 29525 Educational Psychology	3		C	
BSCI 30156 Elements of Genetics	3	•	C	
PHY 13001 General College Phys I	4		C	
PHY 13021 General College Phys I Lab	1		C	
CHEM 10061 General Chemistry II	4		C	
CHEM 10063 General Chemistry Lab II	1		C	
Semester Five: [18 Credit Hours]				
ITEC 19525 Educational Technology	3		C	
ADED 32142 Princ. Of Teaching Adol.	3	•	C	
C&I 47330 Reading & Writing in ADED	3	•	C	
CHEM 20481 Basic Organic Chemistry 1	4		C	
PHY 13002 General College Phys II	4		C	
PHY 13022 General Coll. Phys II Lab	1		C	
Semester Six: [18 Credit Hours]				

New course sequence BSE - LSCM

KENT STATE UNIVERSITY

Roadmap: Life Science - Chemistry -Bachelor of Science in Education
[EH-BSE-LSCM]
College of Education, Health, and Human Services
School of Teaching, Learning, and Curriculum Studies
Catalog Year: 2010-2011

Course Subject and Title	Credit Hours	Upper Division	Min. Grade	Important Notes
ADED 32277 Teach Science in Sec Sch	3	•	C	
SPED 23000 Intro to Exceptionalities	3		C	
CHEM 30284 Intro Biochemistry	4	•	C	
CHEM 30301 Inorganic Chemistry 1	2	•	C	
BSCI 40163 Organic Evolution	3	•	C	
MATH 10041 Or 30011Prob & Stats	3			
Semester Seven: [18 Credit Hours]				
ADED 42277 Topics in Sec Sch Science	3	•	C	
ADED 42292 Field Work Practicum	3	•	C	
CHEM 30105 Analytic Chemistry 1	3	•	C	
BSCI 30360 General Ecology	4	•	C	
BSCI 20140 Cell Biology	4		C	
CHEM 30475 Organic Chem Lab	1	•	C	
Semester Eight: [12 Credit Hours]				
ADED 49525 Inq into Professional Prac	3	•	C	
ADED 42357 Student Teaching	9	•	S	

Graduation Requirements Summary

Minimum Total Hours	Upper-Division Hours	Liberal Education Requirements Hours	Diversity Course Global / Domestic	Writing-Intensive	Minimum Major GPA	Minimum Overall GPA
134	45	36	PHIL 11001/SPED 23000	ADED 32142	2.6	2.75

Note 1: XXXX (X credit hours), choose from the following:

Additional Notes for the XXX program: [IF ANY]

-
-
-

Liberal Education Requirements (LER)
Students must complete a minimum 36 credit hours of Liberal Education Requirements. Colleges or degree programs may specify certain courses to fulfill the requirements. Courses in the students' major field will not count toward the completion of any LER. Honors equivalents shall satisfy the LER. None of the courses on the LER list may be taken with a pass/fail grade.

Diversity Course Requirement
Students must complete a two-course diversity requirement, consisting of one with a domestic focus and one with a global focus. One course must be come from the LER and cannot be in the student's major. The second course may be taken as a second LER; or within a major or minor; or as a general elective; or, with dean's approval, by completing one semester of study in another country.

Writing-Intensive Course Requirement
Students must complete a one-course writing-intensive requirement in their major and earn minimum C (2.00) grade.

Upper-Division Requirement
In general, baccalaureate programs require the successful completion of at least 39 upper-division (numbered 30000 to 49999) credit hours of coursework. Programs in the College of Arts and Sciences require a minimum of 42 hours of upper-division coursework.

KENT STATE UNIVERSITY
CERTIFICATION OF CURRICULUM PROPOSAL

Preparation Date 27-Oct-09 Curriculum Bulletin _____

Effective Date Fall 2010 Approved by EPC _____

Department	TLC
College	EH - Education, Health and Human Services
Degree	BSE - Bachelor of Science in Education
Program Name	**Life Science Bachelor of Science in Education** Program Code **LFSC**
Concentration(s)	Concentration(s) Code(s)
Proposal	Revise Program Requirement

Description of proposal:

The ADED (Adolescent Adult Education) Life Science program leads to teaching licensure in a life science. The ADED students (undergraduates) complete the coursework leading to a bachelors degree as well as licensure. This program is subject to the NCATE/NSTA competency standards that are used to guide our program's accreditation.

Proposed Actions:

Delete	COMM 15000 Intro to Human Communications (3)
Delete	SOC 22778 Social Problems (3)
Delete	GEOL 34061 Invertebrate Paleontology (4)
Delete/Combine Options	BSCI 20275 Local Flora; BSCI 20560 Invertebrate Zoology; BSCI 30518 Vertebrate Anatomy, BSCI 30580 Entomology; BSCI 30582 Ornithology; BSCI 40364 Limnology; BSCI 40556 Vertebrate Zoology (4)
Delete	BSCI 30030 Human Physiology; BSCI 40430 Gen. Physiology (4)
Delete	PHY 11030 7 Ideas that Shook the Universe (3)
Delete	GEOG 41073 Conservation of Natural Resources (3)
Change	COMM 26000 Criticism of Public Discourse (3) to "Choose ONE LER from HUMANITIES" (3)
Add	PHY 13002 General Physics II (4)
Add	PHY 13022 General Physics II Lab (1)
Add	GEOL 10042 Earth History (3)
Add	GEOL 10043 Earth History Lab (1)

Does proposed revision change program's total credit hours? ☒ Yes ☐ No

Current total credit hours: 147 Proposed total credit hours 132

Describe impact on other programs, policies or procedures (e.g., encroachment and duplication issues; enrollment and staffing considerations; need; audience; prerequisites; teacher education licensure):

This curriculum proposal outlines changes to the current program. Specific courses have been added and deleted from the program.The proposed changes will accomplish two important goals:
(1) reduce overall credit hours for the program from 147 to 132, as per directive from Associate Dean in order for the program to fit within a four-year timeframe (please see associated "roadmaps"); and
(2) increase or maintain the number of NCATE (accreditation) competencies met from 36/44 (81.8%) to 40/44 (90.9%).

The proposed changes will impact enrollment in courses offered by the following College of Arts and Sciences departments: Communications, Sociology, Geology, Biology, Physics, and Geography.

Units consulted (other departments, programs or campuses affected by this proposal):

Arts and Sciences faculty from Biology were consulted in April 2009, and Arts and Sciences faculty from Biology, Chemistry, Physics, and Geology were consulted again in October 2009.

REQUIRED ENDORSEMENTS

_____	11/12/09
Department Chair / School Director / Campus Dean	
_____	___/___/___
College Dean	
_____	___/___/___
Executive Dean of Regional Campuses / Dean of Graduate Studies	
_____	___/___/___
Senior Vice President for Academic Affairs and Provost	

KENT STATE UNIVERSITY

Roadmap: Life Science - Bachelor of Science in Education
[EH-BSE-LFSC]
College of Education, Health and Human Services
School of Teaching, Learning and Curriculum Studies
Catalog Year: 2009-2010

Critical requirements are boldface in shaded areas

Course Subject and Title	Credit Hours	Upper Division	Min. Grade	Important Notes
Semester One: [14 Credit Hours]				
BSCI 10110 Biological Diversity	**4**			
ENG 11011 College Writing I	**3**		**C**	**Fulfills LER Composition**
MATH 11010 Algebra for Calculus	3			Course may be waived based on placement; fulfills LER Mathematics and Critical Reasoning
PSYC 11762 General Psychology	3			Fulfills LER Social Sciences
US 10097 Destination Kent State: FYE	1			Not required of transfer students with 25 credits
Semester Two: [15 Credit Hours]				
Requirement: successful completion of Praxis I in Reading (175 score), Writing (173 score) and Mathematics (174 score)				
BSCI 10120 Biological Foundations	**4**			
EDPF 29535 Education in a Democratic Society	**3**		**C**	"choose ONE from LER Humanities"
COMM 26000 ~~Criticism~~ of Public Discourse change to	3			Fulfills LER Humanities
MATH 11022 Trigonometry	2		C	Course may be waived based on placement
SOC 12050 Introduction to Sociology	3			Fulfills LER Social Sciences
Semester Three: [17 Credit Hours]				
Requirement: minimum 2.75 cumulative GPA by end of term				
CHEM 10060 General Chemistry I	**4**			
CHEM 10062 General Chemistry I Laboratory	**1**			
ENG 21011 College Writing II	**3**		**C**	**Fulfills LER Composition**
MATH 12002 Analytical Geometry and Calculus I	**5**			
BSCI 30140 Cell Biology	4			
Semester Four: [18 Credit Hours]				
Requirement: apply for and be accepted to Advanced Study by end of term; minimum 2.75 cumulative GPA				
CHEM 10061 General Chemistry II	**4**			
CHEM 10063 General Chemistry II Laboratory	**1**			
EDPF 29525 Educational Psychology	**3**		**C**	
BSCI 20560 Invertebrate Zoology *or* BSCI 30275 Local Flora *or* BSCI 30518 Vertebrate Anatomy add options	4			BSCI 30580 Entomology, BSCI 30582 Ornithology, BSCI 40364 Limnology, BSCI 40556 Vertebrate Zoology
BSCI 30156 Elements of Genetics	3			
PHIL 11001 Introduction to Philosophy	3			Fulfills LER Humanities and global diversity course requirement
Semester Five: [18 Credit Hours]				
Requirement: apply for student teaching				
ADED 32142 Principles of Teaching Adolescents	**3**		**C**	**Fulfills writing-intensive course requirement; offered in fall only**
ITED 19525 Instructional Technology	**3**		**C**	
CHEM 20481 Basic Organic Chemistry I	4			
CI 47330 Reading and Writing in Adolescence/ Adulthood	3		C	
PHY 13001 General College Physics I	4			Fulfills LER Basic Sciences
PHY 13021 General College Physics I Laboratory	1			

Edited Copy BSE - LFSC

KENT STATE UNIVERSITY

Roadmap: Life Science - Bachelor of Science in Education
[EH-BSE-LFSC]
College of Education, Health and Human Services
School of Teaching, Learning and Curriculum Studies
Catalog Year: 2009-2010

Course Subject and Title	Credit Hours	Upper Division	Min. Grade	Important Notes
Semester Six: [17 Credit Hours]				
ADED 32277 Teaching Science in Secondary Schools	3		C	Offered in spring only
BSCI 30360 General Ecology	4			
BSCI 40163 Organic Evolution	3			
CHEM 30284 Introduction to Biological Chemistry	4			(Fulfills LER Basic Sciences)
GEOG 41073 Conservation of Natural Resources	3	Add	GEOL	10042 Earth History (3) and GEOL 10043 Lab (1)
Semester Seven: [18 Credit Hours]				
ADED 42277 Topics in Secondary School Science	3		C	
ADED 42292 Field Work Practicum	3		C	
BSCI 30030 Human Physiology *or* BSCI 40430 Animal Physiology DELETE	4			
BSCI 30580 Entomology Delete *or* BSCI 30582 Ornithology *or* BSCI 40364 Limnology *or* BSCI 40556 Vertebrate Zoology	4 5	Add	PHY 13002	General Physics II (4) and PHY 13022 General Physics Lab II (1)
GEOL 34061 Invertebrate Paleontology DELETE	4			Prerequisite waived for Life Science majors
Semester Eight: [12 Credit Hours]				
ADED 42357 Student Teaching	9		S	
ADED 49525 Inquiry into Professional Practice	3		C	
Semester Nine: [18 Credit Hours]				
Any or all courses may be taken during undergraduate summer semester(s)				
COMM 15000 Introduction to Human Communication	3	DELETE		Fulfills LER Additional
MATH 10041 Elementary Probability and Statistics *or* MATH 30011 Basic Probability and Statistics	3			
PHY 1130 Seven Ideas that Shook the Universe	3	DELETE		Fulfills LER Basic Sciences
SOC 22778 Social Problems	3	DELETE		Fulfills LER Additional
SPED 23000 Introduction to Exceptionalities	3		C	Fulfills domestic diversity course requirement
LER Fine Arts	3			Visit www.kent.edu/catalog and search "LER" for course list

Graduation Requirements Summary

Total Hours	Upper-Division Hours	Liberal Education Requirements Hours	Diversity Course Global / Domestic	Writing-Intensive	Minimum Major GPA	Minimum Overall GPA
147 132	39 45	36	PHIL 11001 / SPED 23000	ADED 32142	2.6	2.75

Notes on Licensure:

1. Complete Praxis II "Principles of Learning and Teaching grades 7-12" (passing score 165) and Praxis II specialty test.
2. Apply for teaching license (pick up licensure packet in 304 White Hall).

Liberal Education Requirements (LER)
Students must complete a minimum 36 credit hours of Liberal Education Requirements. Colleges or degree programs may specify certain courses to fulfill the requirements. Courses in the students' major field will not count toward the completion of any LER. Honors equivalents shall satisfy the LER. None of the courses on the LER list may be taken with a pass/fail grade.

Diversity Course Requirement
Students must complete a two-course diversity requirement, consisting of one with a domestic focus and one with a global focus. One course must be come from the LER and cannot be in the student's major. The second course may be taken as a second LER; or within a major or minor; or as a general elective; or, with dean's approval, by completing one semester of study in another country.

Writing-Intensive Course Requirement
Students must complete a one-course writing-intensive requirement in their major and earn minimum C (2.00) grade.

Upper-Division Requirement
In general, baccalaureate programs require the successful completion of at least 39 upper-division (numbered 30000 to 49999) credit hours of coursework. Programs in the College of Arts and Sciences require a minimum of 42 hours of upper-division coursework.

KENT STATE UNIVERSITY

Roadmap: Life Science - Bachelor of Science in Education
[EH-BSE-LFSC]
College of Education, Health, and Human Services
School of Teaching, Learning, and Curriculum Studies
Catalog Year: 2010-2011

Critical requirements are boldface in shaded areas

Course Subject and Title	Credit Hours	Upper Division	Min. Grade	Important Notes
Semester One: [17 Credit Hours]				
US 10097 FYE FLASH Point	1			
MATH 11010 Algebra for Calculus	3			
BSCI 10110 Bio Diversity	4		C	
Fine Art LER	3			
ENG 11011 College Writing 1	3			
PSYCH 11762 General Psychology	3			
Semester Two: [18 Credit Hours]				
MATH 11022 Trigonometry	2			
BSCI 10120 Bio Foundations	4		C	
SOC 12050 Intro to Sociology	3			
Humanities LER	3			
EDPF 29535 Ed. in a Democratic Society	3		C	
SPED 23000 Intro. To Exceptionalities	3		C	
Semester Three: [17 Credit Hours]				
MATH 12002 Analytical Geom. & Calc 1	5			
ENG 21011 College Writing II	3			
GEOL 10042 Earth History	3		C	
GEOL 10043 Earth History Lab	1		C	
CHEM 10060 General Chemistry 1	4		C	
CHEM 10062 Chemistry Lab 1	1		C	
Semester Four: [18 Credit Hours]				
EDPF 29525 Educational Psychology	3		C	
BSCI 30156 Elements of Genetics	3	•	C	
PHIL 11001 Introduction to Psychology	3			
CHEM 10061 General Chemistry II	4		C	
CHEM 10063 Chemistry Lab II	1		C	
BSCI (Organismal, see list)	4		C	
Semester Five: [18 Credit Hours]				
ITEC 19525 Educational Technology	3		C	
ADED 32142 Princ. Of Teaching Adol.	3	•	C	
C&I 47330 Reading & Writing in ADED	3	•	C	
CHEM 20481 Basic Organic Chemistry I	4		C	
PHY 13001 General College Phys I	4		C	
PHY 13021 General College Phys I Lab	1		C	
Semester Six: [18 Credit Hours]				

New Course Sequence BSE-LFSC

KENT STATE UNIVERSITY

Roadmap: Life Science - Bachelor of Science in Education
[EH-BSE-LFSC]
College of Education, Health, and Human Services
School of Teaching, Learning, and Curriculum Studies
Catalog Year: 2010-2011

Course Subject and Title	Credit Hours	Upper Division	Min. Grade	Important Notes
ADED 32277 Teach Science in Sec Sch	3	•	C	
CHEM 30284 Intro Biochemistry	4	•	C	
PHY 13002 General College Phys II	4		C	
PHY 13022 General Coll. Phys II Lab	1		C	
BSCI 40163 Organic Evolution	3	•	C	
Semester Seven: [17 Credit Hours]				
ADED 42277 Topics in Sec Sch Science	3	•	C	
ADED 42292 Field Work Practicum	3	•	C	
BSCI 30360 General Ecology	4	•	C	
BSCI 20140 Cell Biology	4		C	
MATH 10041 or 30011 Prob & Stats	3			
Semester Eight: [12 Credit Hours]				
ADED 49525 Inq into Professional Prac	3	•	C	
ADED 42357 Student Teaching	9	•	S	

Graduation Requirements Summary

Minimum Total Hours	Upper-Division Hours	Liberal Education Requirements Hours	Diversity Course Global / Domestic	Writing-Intensive	Minimum Major GPA	Minimum Overall GPA
132	45	36	PHIL 11001/SPED 23000	ADED 32142	2.6	2.75

Note 1: XXXX (X credit hours), choose from the following:

Additional Notes for the XXX program: [IF ANY]

-
-
-

Liberal Education Requirements (LER)
Students must complete a minimum 36 credit hours of Liberal Education Requirements. Colleges or degree programs may specify certain courses to fulfill the requirements. Courses in the students' major field will not count toward the completion of any LER. Honors equivalents shall satisfy the LER. None of the courses on the LER list may be taken with a pass/fail grade.

Diversity Course Requirement
Students must complete a two-course diversity requirement, consisting of one with a domestic focus and one with a global focus. One course must be come from the LER and cannot be in the student's major. The second course may be taken as a second LER; or within a major or minor; or as a general elective; or, with dean's approval, by completing one semester of study in another country.

Writing-Intensive Course Requirement
Students must complete a one-course writing-intensive requirement in their major and earn minimum C (2.00) grade.

Upper-Division Requirement
In general, baccalaureate programs require the successful completion of at least 39 upper-division (numbered 30000 to 49999) credit hours of coursework. Programs in the College of Arts and Sciences require a minimum of 42 hours of upper-division coursework.

KENT STATE UNIVERSITY
CERTIFICATION OF CURRICULUM PROPOSAL

Preparation Date 27-Oct-09 Curriculum Bulletin _____

Effective Date Fall 2010 Approved by EPC _____

Department	TLC
College	EH - Education, Health and Human Services
Degree	BSE - Bachelor of Science in Education
Program Name	**Physical Science Bachelor of Science in Education** Program Code **PHSC**
Concentration(s)	Concentration(s) Code(s)
Proposal	Revise Program Requirement

Description of proposal:

The ADED (Adolescent Adult Education) Physical Science program leads to teaching licensure in a physical science. The ADED students (undergraduates) complete the coursework leading to a bachelors degree as well as licensure. Each program is subject to the NCATE/NSTA competency standards that are used to guide our program's accreditation.

Proposed Actions:

Delete	COMM 15000 Intro to Human Communication (3)
Delete	SOC 22778 Social Problems (3)
Delete	PHY 11030 7 Ideas That Shook Universe (3)
Delete	GEOL 41025 Geophysics (3)
Change	PHY 32511 Electronics (4) to "Choose PHY 32511 Electronics OR PHY 36002 Applications of Modern Physics (4)"
Change	COMM 26000 Criticism of Public Discourse (3) to "Choose ONE LER from HUMANITIES" (3)
Change	CHEM 30101 Quantitative Analysis (2) to CHEM 30105 Analytical Chemistry (3)
Change	CHEM 30360 Aqueous and Descriptive Inorganic (2) to CHEM 30301 Inorganic Chemistry I (2)

Does proposed revision change program's total credit hours? ☒ Yes ☐ No

Current total credit hours: 143 Proposed total credit hours 132

Describe impact on other programs, policies or procedures (e.g., encroachment and duplication issues; enrollment and staffing considerations; need; audience; prerequisites; teacher education licensure):

This curriculum proposal outlines changes to the current program. Specific courses have been added and deleted from the program.The proposed changes will accomplish four important goals:
(1) reduce overall credit hours for the program from 143 to 132, as per directive from Associate Dean in order for the program to fit within a four-year timeframe (please see associated "roadmaps");
(2) increase or maintain the number of NCATE (accreditation) competencies met from 78.5/85 (92.3%) to 81/85 (95.2%); and
(3) correct prerequisite errors by either including appropriate prerequisites or deleting courses for which prerequisites could not be met (e.g. eliminating GEOL 41025 Geophysics for which a prerequisite was not included in the previous program); and
(4) update the program requirements to reflect changes that have occurred in other college's course offerings (e.g. CHEM 30101 Quantitative Analysis has changed to CHEM 30105 Analytical Chemistry I; CHEM 30360 Aqueous and Descriptive Inorganic has changed to CHEM 30301 Inorganic Chemistry I; and likely reduction in offering of PHY 32511 Electronics to every 2 years, now alternating with PHY 36002 Applications of Modern Physics).

The proposed changes will impact enrollment in courses offered by the following College of Arts and Sciences departments: Communications, Sociology, Physics, Geology, and Chemistry.

Units consulted (other departments, programs or campuses affected by this proposal):
Arts and Sciences faculty from Chemistry were consulted in April 2009, and Arts and Sciences faculty from Chemistry, Geology, and Physics were contacted again in October 2009.

REQUIRED ENDORSEMENTS

_____	11/12/09
Department Chair / School Director / Campus Dean	
_____	___/___/___
College Dean	
_____	___/___/___
Executive Dean of Regional Campuses / Dean of Graduate Studies	
_____	___/___/___
Senior Vice President for Academic Affairs and Provost	

KENT STATE UNIVERSITY

Roadmap: Physical Science - Bachelor of Science in Education
[EH-BSE-PHSC]
College of Education, Health, and Human Services
School of Teaching, Learning and Curriculum Studies
Catalog Year: 2009-2010

Critical requirements are boldface in shaded areas

Course Subject and Title	Credit Hours	Upper Division	Min. Grade	Important Notes
Semester One: [18 Credit Hours]				
ENG 11011 College Writing I	3		C	Fulfills LER Composition
CHEM 10060 General Chemistry I	4			Fulfills LER Basic Sciences
CHEM 10062 General Chemistry Laboratory I	1			Fulfills LER Basic Sciences Laboratory
MATH 11010 Algebra for Calculus	3			Fulfills LER Mathematics and Critical Reasoning; may be waived by passing the placement exam
PHIL 11001 Introduction to Philosophy	3			Fulfills LER Humanities and global diversity course requirement
PSYC 11762 General Psychology	3			Fulfills LER Social Sciences
US 10097 Destination Kent State: FYE	1			Not required for transfer students with 25 credits
Semester Two: [16 Credit Hours]				
Requirement: successful completion of Praxis I Reading (score 175), Writing (score 173) and Mathematics (score 174)				
EDPF 29535 Education in a Democratic Society	3		C	
CHEM 10061 General Chemistry II	4		C	
CHEM 10063 General Chemistry Laboratory II	1		C	LER from Humanities
COMM 26000 Criticism of Public Discourse — Change to Increase Cr.	3			Fulfills LER Humanities
MATH 11022 Trigonometry	2			
SOC 12050 Introduction to Sociology	3			Fulfills LER Social Sciences
Semester Three: [16 Credit Hours]				
Requirement: minimum cumulative 2.75 GPA by end of term; minimum C grade and 2.6 GPA required in content area coursework				
EDPF 29525 Educational Psychology	3		C	
MATH 12002 Analytic Geometry and Calculus I	5			
PHY 23101 General University Physics I	5		C	
ENG 21011 College Writing II	3		C	Fulfills LER Composition
Semester Four: [18 Credit Hours]				
Requirement: apply and be accepted for Advanced Study. 2.75 minimum cumulative GPA required				
PHY 23102 General University Physics II	5		C	
BSCI 10120 Biological Foundations	4		C	
CHEM 20481 Basic Organic Chemistry I	4		C	
MATH 12003 Analytic Geometry and Calculus II	5		C	
Semester Five: [16 Credit Hours]				
Requirement: apply for student teaching				
ADED 32142 Principles of Teaching Adolescents	3	■	C	Fulfills writing intensive requirements; offered in fall only
ITEC 19525 Educational Technology	3		C	
CHEM 40581 Basics of Physical Chemistry	4	■	C	
CI 47330 Reading and Writing in Adolescence	3	■	C	
GEOG 31062 Fundamentals of Meteorology	3	■	C	

Edited Copy BSE - PHSC

KENT STATE UNIVERSITY

Roadmap: Physical Science - Bachelor of Science in Education
[EH-BSE-PHSC]
College of Education, Health, and Human Services
School of Teaching, Learning and Curriculum Studies
Catalog Year: 2009-2010

Course Subject and Title	Credit Hours	Upper Division	Min. Grade	Important Notes
Semester Six: [17 Credit Hours]				
ADED 32277 Teaching Science in Secondary Schools	3	■	C	
CHEM 30301 Inorganic Chemistry I	2	■	C	
CHEM 30284 Introduction to Biological Chemistry	4	■	C	
PHY 21430 Frontiers in Astronomy *or* PHY 24001 Astronomy	3		C	
PHY 30020 Intermediate Physics Laboratory	2	■	C	Fulfills writing-intensive course requirement
PHY 36001 Introduction to Modern Physics	3	■	C	
Semester Seven: [16 Credit Hours]				
ADED 42277 Topics in Secondary School Science	3	■	C	
ADED 42292 Field Work Practicum	3	■	C	
CHEM 30105 Analytical Chemistry I	3	■	C	
GEOL 41021 General Geophysics DELETE	3	■	C	
PHY 32511 Electronics OR PHY 36002 Applications of Modern Physics	4	■		
Semester Eight: [12 Credit Hours]				
COMM 15000 Introduction to Human Communication	3	DELETE		Fulfills LER Additional
PHY 11030 Seven Ideas that Shook the Universe DELETE	3			Fulfills LER Basic Sciences
SOC 22778 Social Problems DELETE	3			Fulfills LER Additional
SPED 23000 Introduction to Exceptionalities	3			Fulfills domestic diversity course requirement
LER Fine Arts	3			Visit www.kent.edu/catalog and search "LER" for course lists
Semester Nine: [15 Credit Hours]				
ADED 42357 Secondary Student Teaching	9	■	S	
ADED 49525 Inquiry into Professional Practice	3	■	C	

Graduation Requirements Summary

Total Hours	Upper-Division Hours	Liberal Education Requirements Hours	Diversity Course Global / Domestic	Writing-Intensive	Minimum Major GPA	Minimum Overall GPA
142-144 / 132	39 / 46	36	SPED 23000 / PHIL 11001	ADED 32142	2.6	2.75

Note on Licensure:

...ssful complete Praxis II "...dge of Learning and Teaching" and Praxis II specialty test "Chemistry–Content ...dge" (passing score 152) and "Physics–Content Knowledge" (passing score 132) by the end of second semester. ...or teaching licen... up licensure packet in 304 White Hall).

...n Requirements (LER)
...mplete a minimum 36 credit hours of Liberal Education Requirements. Colleges or degree programs may specify certain ...he requirements. Courses in the students' major field will not count toward the completion of any LER. Honors equivalents ...LER. None of the courses on the LER list may be taken with a pass/fail grade.

...Requirement
...s a two-course diversity requirement, consisting of one with a domestic focus and one with a global focus. One course ...om the LER and cannot be in the student's major. The second course may be taken as a second LER; or within a major or ...neral elective; or, with dean's approval, by completing one semester of study in another country.

...Course Requirement
...omplete a one-course writing-intensive requirement in their major and earn minimum C (2.00) grade.

...Requirement
...laureate programs require the successful completion of at least 39 upper-division (numbered 30000 to 49999) credit hours of ...grams in the College of Arts and Sciences require a minimum of 42 hours of upper-division coursework.

KENT STATE UNIVERSITY

Roadmap: Physical Science - Bachelor of Science in Education
[EH-BSE-PHSC]
College of Education, Health, and Human Services
School of Teaching, Learning, and Curriculum Studies
Catalog Year: 2010-2011

Critical requirements are boldface in shaded areas

Course Subject and Title	Credit Hours	Upper Division	Min. Grade	Important Notes
Semester One: [18 Credit Hours]				
US 10097 FYE FLASH Point	1			
MATH 11010 Algebra for Calculus	3			
CHEM 10060 General Chemistry I	4		C	
CHEM 10062 Chemistry Lab I	1		C	
ENG 11011 College Writing I	3			
PSYCH 11762 General Psychology	3			
Fine Art LER	3			
Semester Two: [16 Credit Hours]				
MATH 11022 Trigonometry	2			
CHEM 10061 General Chemistry II	4		C	
CHEM 10063 Chemistry Lab II	1		C	
SOC 12050 Intro to Sociology	3			
Humanities LER	3			
EDPF 29535 Ed. in a Democratic Society	3		C	
Semester Three: [16 Credit Hours]				
PHY 23101 General Univer. Physics I	5		C	
MATH 12002 Analytical Geom. & Calc 1	5			
EDPF 29525 Educational Psychology	3		C	
ENG 21011 College Writing II	3			
Semester Four: [18 Credit Hours]				
PHY 23102 General Univer. Physics II	5		C	
MATH 12003 Analytical Geom. & Calc II	5			
CHEM 20481 Basic Organic Chemistry I	4		C	
BSCI 10120 Bio Foundations	4		C	
Semester Five: [18 Credit Hours]				
ITEC 19525 Educational Technology	3		C	
PHIL 11001 Intro to Philosophy	3			
ADED 32142 Princ. Of Teaching Adol.	3	•	C	
C&I 47330 Reading & Writing in ADED	3	•	C	
SPED 23000 Intro. to Exceptionalities	3		C	
CHEM 30105 Analytical Chemistry I	3	•	C	
Semester Six: [17 Credit Hours]				
ADED 32277 Teach Science in Sec Sch	3	•	C	
PHYS 36001 Modern Physics I	3	•	C	
CHEM 30284 Intro Biochemistry	4	•	C	

New Course Sequence BSE-PHSC

KENT STATE UNIVERSITY

Roadmap: Physical Science - Bachelor of Science in Education
[EH-BSE-PHSC]
College of Education, Health, and Human Services
School of Teaching, Learning, and Curriculum Studies
Catalog Year: 2010-2011

Course Subject and Title	Credit Hours	Upper Division	Min. Grade	Important Notes
CHEM 30301 Inorganic Chemistry I	2	•	C	
PHYS 30020 Intermediate Physics Lab	2	•	C	
PHYS 21430 Frontiers in Astronomy	3		C	
Semester Seven: [17 Credit Hours]				
ADED 42277 Topics in Sec Sch Science	3	•	C	
ADED 42292 Field Work Practicum	3	•	C	
GEOG 31062 Meteorology	3	•	C	
PHYS 32511/36002 Electronics/Apps of Mod Phys	4	•	C	
CHEM 40567 Basics of Physical Chem.	4	•	C	
Semester Eight: [12 Credit Hours]				
ADED 49525 Inq into Professional Prac	3	•	C	
ADED 42357 Student Teaching	9	•	S	

Graduation Requirements Summary

Minimum Total Hours	Upper-Division Hours	Liberal Education Requirements Hours	Diversity Course Global / Domestic	Writing-Intensive	Minimum Major GPA	Minimum Overall GPA
132	46	36	PHIL 11001/SPED 23000	ADED 32142	2.6	2.75

Note 1: XXXX (X credit hours), choose from the following:

Additional Notes for the XXX program: [IF ANY]

-
-
-

Liberal Education Requirements (LER)
Students must complete a minimum 36 credit hours of Liberal Education Requirements. Colleges or degree programs may specify certain courses to fulfill the requirements. Courses in the students' major field will not count toward the completion of any LER. Honors equivalents shall satisfy the LER. None of the courses on the LER list may be taken with a pass/fail grade.

Diversity Course Requirement
Students must complete a two-course diversity requirement, consisting of one with a domestic focus and one with a global focus. One course must be come from the LER and cannot be in the student's major. The second course may be taken as a second LER; or within a major or minor; or as a general elective; or, with dean's approval, by completing one semester of study in another country.

Writing-Intensive Course Requirement
Students must complete a one-course writing-intensive requirement in their major and earn minimum C (2.00) grade.

Upper-Division Requirement

In general, baccalaureate programs require the successful completion of at least 39 upper-division (numbered 30000 to 49999) credit hours of coursework. Programs in the College of Arts and Sciences require a minimum of 42 hours of upper-division coursework.

KENT STATE UNIVERSITY
CERTIFICATION OF CURRICULUM PROPOSAL

Preparation Date 27-Oct-09 Curriculum Bulletin _____

Effective Date Fall 2010 Approved by EPC _____

Department	TLC
College	EH - Education, Health and Human Services
Degree	BSE - Bachelor of Science in Education
Program Name	**Earth Science Bachelor of Science in Education** Program Code **ESCI**
Concentration(s)	Concentration(s) Code(s)
Proposal	Revise Program Requirement

Description of proposal:

The ADED (Adolescent Adult Education) Earth Science program leads to teaching licensure in a earth science. The ADED students (undergraduates) complete the coursework leading to a bachelors degree as well as licensure. This program is subject to the NCATE/NSTA competency standards that are used to guide our program's accreditation.

Proposed Actions:

Delete	COMM 15000 Intro to Human Comm (3)
Delete	SOC 22778 Social Problems (3)
Delete	GEOL 34061 Invertebrate Paleontology (4)
Delete	GEOG 41082 Geography Soils (3)
Change	COMM 26000 Criticism of Public Discourse (3) to "Choose ONE LER from HUMANITIES" (3)
Add	PHYS 13002 General Physics II (4)
Add	PHYS 13022 General Physics II Lab (1)

Does proposed revision change program's total credit hours? ☒ Yes ☐ No

Current total credit hours: 141 Proposed total credit hours 133

Describe impact on other programs, policies or procedures (e.g., encroachment and duplication issues; enrollment and staffing considerations; need; audience; prerequisites; teacher education licensure):

This curriculum proposal outlines changes to the current program. Specific courses have been added and deleted from the program.The proposed changes will accomplish three important goals:
(1) reduce overall credit hours for the program from 141 to 133, as per directive from Associate Dean in order for the program to fit within a four-year timeframe (please see associated "roadmaps");
(2) increase or maintain the number of NCATE (accreditation) competencies met from 42/48 (87.5%) to 46/48 (95.8%); and
(3) correct prerequisite errors by either including appropriate prerequisites or deleting courses for which prerequisites could not be met (e.g. eliminating GEOG 41082 Geography of Soils for which a prerequisite was not included in the previous program).

The proposed changes will impact enrollment in courses offered by the following College of Arts and Sciences departments: Communications, Sociology, Physics, Geology, and Geology.

Units consulted (other departments, programs or campuses affected by this proposal):

Arts and Sciences faculty from Geology and Physics were consulted in October 2009.

REQUIRED ENDORSEMENTS

Alexa L Sandmann — 11/12/09

Department Chair / School Director / Campus Dean

_____ ___/___/___

College Dean

_____ ___/___/___

Executive Dean of Regional Campuses / Dean of Graduate Studies

_____ ___/___/___

Senior Vice President for Academic Affairs and Provost

KENT STATE UNIVERSITY

Roadmap: Earth Science - Bachelor of Science in Education

[EH-BSE-ESCI]
College of Education, Health and Human Services
School of Teaching, Learning and Curriculum Studies
Catalog Year: 2009-2010

Critical requirements are boldface in shaded areas

Course Subject and Title	Credit Hours	Upper Division	Min. Grade	Important Notes
Semester One: [18 Credit Hours]				
GEOL 11040 Earth Dynamics	**3**			**Fulfills LER Basic Sciences**
GEOL 11041 Earth Dynamics Laboratory	**1**			**Fulfills LER Basic Sciences**
BSCI 10110 Biological Diversity	4		C	
ENG 11011 College Writing I	3		C	Fulfills LER Composition
MATH 11010 Algebra for Calculus	3			Fulfills LER Mathematics and Critical Reasoning; may be waived based on placement test
PSYC 11762 General Psychology	3			Fulfills LER Social Sciences
US 10097 Destination Kent State: FYE	1			Not required of transfer students with 25 credits
Semester Two: [16 Credit Hours]				
Requirement: pass Praxis I Reading (175 score), Writing (173 score) and Mathematics (174 score)				
EDPF 29535 Education in a Democratic Society	**3**		**C**	
BSCI 10120 Biological Foundations	4		C	
GEOL 11042 Earth History	3		C	
GEOL 11043 Earth History Laboratory	1		C	
MATH 11022 Trigonometry	2			May be waived based on placement test
SOC 12020 Introduction to Sociology	3			Fulfills LER Social Sciences
Semester Three: [16 Credit Hours]				
EDPF 29525 Educational Psychology	**3**		**C**	
ENG 21011 College Writing II	**3**		**C**	
MATH 12002 Analytical Geometry and Calculus I	**5**			
CHEM 10060 General Chemistry I	4		C	
CHEM 10062 General Chemistry Laboratory I	1		C	
Semester Four: [17 Credit Hours]				
Requirement: apply and be accepted into advanced standing by end of term; minimum 2.75 cumulative GPA				
CHEM 10061 General Chemistry II	4		C	
CHEM 10063 General Chemistry Laboratory II	1		C	→ Change to "Choose ONE from LER Humanities"
COMM 26000 Criticism of Public Discourse	3			Fulfills LER Humanities
GEOL 21080 Oceanography	3		C	
MATH 10041 Elementary Probability and Statistics *or* MATH 30011 Basic Probability and Statistics	3			
PHIL 11001 Introduction to Philosophy	3			Fulfills LER Humanities and global diversity course requirement
Semester Five: [16 Credit Hours]				
Requirement: apply for student teaching				
ADED 32142 Principles of Teaching Adolescents	**3**	■	**C**	**Fulfills writing-intensive course requirement; offered in fall only**
ITEC 19525 Educational Technology	**3**		**C**	
CI 47330 Reading and Writing in Adolescence/ Adulthood	3	■	C	
GEOG 31062 Meteorology	3	■	C	
GEOL 23063 Mineralogy	4		C	

KENT STATE UNIVERSITY

Roadmap: Earth Science - Bachelor of Science in Education
[EH-BSE-ESCI]
College of Education, Health and Human Services
School of Teaching, Learning and Curriculum Studies
Catalog Year: 2009-2010

Course Subject and Title	Credit Hours	Upper Division	Min. Grade	Important Notes
Semester Six: [18 Credit Hours]				
ADED32277 Teaching Science in Secondary Schools	**3**	■	**C**	**Offered in spring only**
GEOG 31064 Climatology	3	■	C	
GEOG 41073 Conservation of Natural Resources	3	■	C	
GEOL 31070 Petrology *or* GEOL 32066 Geomorphology	4	■	C	
PHY 13001 General College Physics I	4		C	
PHY 13021 General College Physics Laboratory I	1		C	
Semester Seven: [17 Credit Hours]				
ADED 42277 Topics in Secondary School Science	**3**	■	**C**	
ADED 42292 Field Work Practicum	**3**	■	**C**	
GEOG 41082 Geography of Soils DELETE	3	■	C	
GEOL 34061 Invertebrate Paleontology DELETE	4	■	C	Fulfills writing-intensive course requirement
PHY 21430 Frontiers in Astronomy *or* PHY 24001 Astronomy	3			Fulfills LER Basic Sciences
Semester Eight: [12 Credit Hours]				
ADED 42357 Student Teaching	**9**	■	**S**	
ADED 49525 Inquiry into Professional Practice	**3**	■	**C**	
Semester Nine: [12 Credit Hours]				
Any or all courses below may also be taken during undergraduate summer semesters				
COMM 15000 Introduction to Human Communication	3	DELETE		Fulfills LER Additional
SOC 22778 Social Problems	3	DELETE		Fulfills LER Additional
SPED 23000 Introduction to Exceptionalities	3		C	Fulfills domestic diversity course requirement
LER Fine Arts	3			Visit www.kent.edu/catalog and search "LER" for course list

Add PHYS 13002 General Physics II (4) and PHYS 13022 General Physics II Lab (1)

Graduation Requirements Summary

Total Hours	Upper-Division Hours	Liberal Education Requirements Hours	Diversity Course Global / Domestic	Writing-Intensive	Minimum Major GPA	Minimum Overall GPA
~~121~~ 133	~~39~~ 40	36	PHIL 11001 / SPED 23000	ADED 32142	2.60	2.75

Notes on Licensure:

1. Successful complete Praxis II "Principles of Learning and Teaching" and Praxis II specialty test "Earth Science-Content Knowledge" (passing score 151).
2. Apply for teaching license (pick up licensure packet in 304 White Hall).

Liberal Education Requirements (LER)
Students must complete a minimum 36 credit hours of Liberal Education Requirements. Colleges or degree programs may specify certain courses to fulfill the requirements. Courses in the students' major field will not count toward the completion of any LER. Honors equivalents shall satisfy the LER. None of the courses on the LER list may be taken with a pass/fail grade.

Diversity Course Requirement
Students must complete a two-course diversity requirement, consisting of one with a domestic focus and one with a global focus. One course must be come from the LER and cannot be in the student's major. The second course may be taken as a second LER; or within a major or minor; or as a general elective; or, with dean's approval, by completing one semester of study in another country.

Writing-Intensive Course Requirement
Students must complete a one-course writing-intensive requirement in their major and earn minimum C (2.00) grade.

Upper-Division Requirement
In general, baccalaureate programs require the successful completion of at least 39 upper-division (numbered 30000 to 49999) credit hours of coursework. Programs in the College of Arts and Sciences require a minimum of 42 hours of upper-division coursework.

KENT STATE UNIVERSITY

Roadmap: Earth Science - Bachelor of Science in Education

[EH-BSE-ESCI]
College of Education, Health and Human Services
School of Teaching, Learning and Curriculum Studies
Catalog Year: 2009-2010

Critical requirements are boldface in shaded areas

Course Subject and Title	Credit Hours	Upper Division	Min. Grade	Important Notes
Semester One: [18 Credit Hours]				
GEOL 11040 Earth Dynamics	**3**			**Fulfills LER Basic Sciences**
GEOL 11041 Earth Dynamics Laboratory	**1**			**Fulfills LER Basic Sciences**
BSCI 10110 Biological Diversity	4		C	
ENG 11011 College Writing I	3		C	Fulfills LER Composition
MATH 11010 Algebra for Calculus	3			Fulfills LER Mathematics and Critical Reasoning; may be waived based on placement test
PSYC 11762 General Psychology	3			Fulfills LER Social Sciences
US 10097 Destination Kent State: FYE	1			Not required of transfer students with 25 credits
Semester Two: [16 Credit Hours]				
Requirement: pass Praxis I Reading (175 score), Writing (173 score) and Mathematics (174 score)				
EDPF 29535 Education in a Democratic Society	**3**		**C**	
BSCI 10120 Biological Foundations	4		C	
GEOL 11042 Earth History	3		C	
GEOL 11043 Earth History Laboratory	1		C	
MATH 11022 Trigonometry	2			May be waived based on placement test
SOC 12020 Introduction to Sociology	3			Fulfills LER Social Sciences
Semester Three: [16 Credit Hours]				
EDPF 29525 Educational Psychology	**3**		**C**	
ENG 21011 College Writing II	**3**		**C**	
MATH 12002 Analytical Geometry and Calculus I	**5**			
CHEM 10060 General Chemistry I	4		C	
CHEM 10062 General Chemistry Laboratory I	1		C	
Semester Four: [17 Credit Hours]				
Requirement: apply and be accepted into advanced standing by end of term; minimum 2.75 cumulative GPA				
CHEM 10061 General Chemistry II	4		C	
CHEM 10063 General Chemistry Laboratory II	1		C	→ Change to "Choose ONE from LER Humanities"
COMM 26000 Criticism of Public Discourse	3			Fulfills LER Humanities
GEOL 21080 Oceanography	3		C	
MATH 10041 Elementary Probability and Statistics / Probability and Statistics	3			
...n to Philosophy	3			Fulfills LER Humanities and global diversity course requirement
...redit Hours]				
...student teaching				
...s of Teaching Adolescents	**3**	■	**C**	**Fulfills writing-intensive course requirement; offered in fall only**
...al Technology	**3**		**C**	
...Writing in Adolescence/	3	■	C	
...ogy	3	■	C	
...gy	4		C	

Late to Core BSE-ESCI

missing 2nd page of roadmap

Need this

KENT STATE UNIVERSITY

Roadmap: Earth Science - Bachelor of Science in Education

[EH-BSE-ESCI]
College of Education, Health, and Human Services
School of Teaching, Learning, and Curriculum Studies
Catalog Year: 2010-2011

Critical requirements are boldface in shaded areas

Course Subject and Title	Credit Hours	Upper Division	Min. Grade	Important Notes
Semester One: [18 Credit Hours]				
US 10097 FYE FLASH Point	1			
MATH 11010 Algebra for Calculus	3			
GEOL 11040 Earth Dynamics	3		C	
GEOL 11041 Earth Dynamics Lab	1		C	
ENG 11011 College Writing 1	3			
PSYCH 11762 General Psychology	3			
BSCI 10110 Bio Diversity	4		C	
Semester Two: [18 Credit Hours]				
MATH 11022 Trigonometry	2			
GEOL 10042 Earth History	3		C	
GEOL 10043 Earth History Lab	1		C	
SOC 12050 Intro to Sociology	3			
EDPF 29535 Ed. in a Democratic Society	3		C	
EDPF 29525 Educational Psychology	3		C	
Fine Art LER	3			
Semester Three: [17 Credit Hours]				
MATH 12002 Analytical Geom. & Calc 1	5			
ENG 21011 College Writing II	3			
CHEM 10060 General Chemistry 1	4		C	
CHEM 10062 Chemistry Lab 1	1		C	
BSCI 10120 Bio Foundations	4		C	
Semester Four: [17 Credit Hours]				
MATH 10041 or 30011Prob & Stats	3			
GEOL 21080 Oceanography	3		C	
PHIL 11001 Introduction to Philosophy	3			
CHEM 10061 General Chemistry II	4		C	
CHEM 10063 Chemistry Lab II	1		C	
Humanities LER	3		C	
Semester Five: [18 Credit Hours]				
ITEC 19525 Educational Technology	3		C	
ADED 32142 Princ. Of Teaching Adol.	3	•	C	
PHY 13001 General College Phys I	4		C	
PHY 13021 General College Phys I Lab	1		C	
GEOL 23063 Mineralogy	4		C	
GEOG 31062 Meteorology	3	•	C	
Semester Six: [18 Credit Hours]				

New course sequence BSE-ESCI

KENT STATE UNIVERSITY

Roadmap: Earth Science - Bachelor of Science in Education
[EH-BSE-ESCI]
College of Education, Health, and Human Services
School of Teaching, Learning, and Curriculum Studies
Catalog Year: 2010-2011

Course Subject and Title	Credit Hours	Upper Division	Min. Grade	Important Notes
ADED 32277 Teach Science in Sec Sch	3	•	C	
GEOG 41073 Conservation of Nat. Res.	3	•	C	
GEOL32066/31070 Geomorphology/Petrology	4	•	C	
PHY 13002 General College Physics II	4		C	
PHY 13022 General College Phy II Lab	1		C	
GEOG 31064 Climatology	3	•	C	
Semester Seven: [15 Credit Hours]				
ADED 42277 Topics in Sec Sch Science	3	•	C	
ADED 42292 Field Work Practicum	3	•	C	
SPED 23000 Intro. to Exceptionalities	3		C	
C&I 47330 Reading & Writing in ADED	3	•	C	
PHY 21430 Frontiers in Astronomy	3		C	
Semester Eight: [12 Credit Hours]				
ADED 49525 Inq into Professional Prac	3	•	C	
ADED 42357 Student Teaching	9	•	S	

Graduation Requirements Summary

Minimum Total Hours	Upper-Division Hours	Liberal Education Requirements Hours	Diversity Course Global / Domestic	Writing-Intensive	Minimum Major GPA	Minimum Overall GPA
133	40	36	PHIL 11001/SPED 23000	ADED 32142	2.6	2.75

Note 1: XXXX (X credit hours), choose from the following:

Additional Notes for the XXX program: [IF ANY]

-
-
-

Liberal Education Requirements (LER)
Students must complete a minimum 36 credit hours of Liberal Education Requirements. Colleges or degree programs may specify certain courses to fulfill the requirements. Courses in the students' major field will not count toward the completion of any LER. Honors equivalents shall satisfy the LER. None of the courses on the LER list may be taken with a pass/fail grade.

Diversity Course Requirement
Students must complete a two-course diversity requirement, consisting of one with a domestic focus and one with a global focus. One course must be come from the LER and cannot be in the student's major. The second course may be taken as a second LER; or within a major or minor; or as a general elective; or, with dean's approval, by completing one semester of study in another country.

Writing-Intensive Course Requirement
Students must complete a one-course writing-intensive requirement in their major and earn minimum C (2.00) grade.

Upper-Division Requirement
In general, baccalaureate programs require the successful completion of at least 39 upper-division (numbered 30000 to 49999) credit hours of coursework. Programs in the College of Arts and Sciences require a minimum of 42 hours of upper-division coursework.

KENT STATE UNIVERSITY
CERTIFICATION OF CURRICULUM PROPOSAL

Preparation Date 27-Oct-09 Curriculum Bulletin _____

Effective Date Fall 2010 Approved by EPC _____

Department	TLC
College	EH - Education, Health and Human Services
Degree	BSE - Bachelor of Science in Education
Program Name	**Integrated Science Bachelor of Science in Education** Program Code **ISCI**
Concentration(s)	Physical Science Concentration(s) Code(s) PHY
Proposal	Revise Program Requirement

Description of proposal:

The ADED (Adolescent Adult Education) Integrated Science program is a 5-year degree that leads to teaching licensure in all science, grades 7-12. The ADED students (undergraduates) complete the coursework leading to a bachelors degree as well as licensure. This program is subject to the NCATE/NSTA competency standards that are used to guide our program's accreditation.

Proposed Actions:

Delete	COMM 15000 Intro to Human Communication (3)
Delete	SOC 22778 Social Problems (3)
Delete	PHY 11030 7 Ideas that Shook the Universe (3)
Delete	GEOL 41025 Geophysics (3)
Delete	CHEM 10030 Chemistry in Our World (3)
Change	PHY 32511 Electronics (4) to "Choose PHY 32511 Electronics OR PHY 36002 Applications of Modern Physics (4)"
Change	COMM 26000 Criticism of Public Discourse (3) to "Choose ONE LER from HUMANITIES" (3)
Add	CHEM 20481 Basic Organic Chemistry (4)

Does proposed revision change program's total credit hours? ☒ Yes ☐ No

Current total credit hours: 159 Proposed total credit hours 148

Describe impact on other programs, policies or procedures (e.g., encroachment and duplication issues; enrollment and staffing considerations; need; audience; prerequisites; teacher education licensure):

This curriculum proposal outlines changes to the current program. Specific courses have been added and deleted from the program.The proposed changes will accomplish four important goals:
(1) reduce overall credit hours for the program from 159 to 148 to make completion of the degree more manageable (please see associated "roadmaps");
(2) maintain the number of NCATE (accreditation) competencies met from 131/135 (97.0%) to 130/135 (96.3%);
(3) correct prerequisite errors by either including appropriate prerequisites or deleting courses for which prerequisites could not be met (e.g. eliminating GEOL 41025 Geophysics for which a prerequisite was not included in the previous program); and
(4) update the program requirements to reflect changes that have occurred in other college's course offerings (e.g. the likely reduction in offering of PHY 32511 Electronics to every 2 years, now alternating with PHY 36002 Applications of Modern Physics).

The proposed changes will impact enrollment in courses offered by the following College of Arts and Sciences departments: Communications, Sociology, Physics, Geology, and Chemistry.

Units consulted (other departments, programs or campuses affected by this proposal):

Arts and Sciences faculty from Chemistry were consulted in April 2009, and Arts and Sciences faculty from Chemistry, Geology, and Physics were consulted again in October 2009

REQUIRED ENDORSEMENTS

Alex T. Sanderson — 11/12/09
Department Chair / School Director / Campus Dean

_____ — __/__/__
College Dean

_____ — __/__/__
Executive Dean of Regional Campuses / Dean of Graduate Studies

_____ — __/__/__
Senior Vice President for Academic Affairs and Provost

KENT STATE UNIVERSITY

Roadmap: Integrated Science - Physics - Bachelor of Science in Education
[EH-BSE-ISCI-PHY]
College of Education, Health and Human Services
School of Teaching, Learning and Curriculum Studies
Catalog Year: 2009-2010

Critical requirements are boldface in shaded areas

Course Subject and Title	Credit Hours	Upper Division	Min. Grade	Important Notes
Semester One: [15 Credit Hours]				
CHEM 10060 General Chemistry I	4		C	
CHEM 10062 General Chemistry Laboratory I	1		C	
ENG 11011 College Writing I	3		C	Fulfills LER Composition
MATH 11010 Algebra for Calculus	3			Fulfills LER Mathematics and Critical Reasoning
PSYC 11762 General Psychology	3			Fulfills LER Social Sciences
US 10097 Destination Kent State: FYE	1			Not required of transfer students with 25 hours
Semester Two: [16 Credit Hours]				
Requirement: pass Praxis I Reading (score 175), Writing (score 173) and Mathematics (score 174)				
EDPF 29535 Education in a Democratic Society	3		C	
CHEM 10061 General Chemistry II	4		C	
CHEM 10063 General Chemistry II	1		C	
COMM 15000 Introduction to Human Communication	3	DELETE		Fulfills LER Additional
MATH 11022 Trigonometry	2		C	
SOC 12050 Introduction to Sociology	3			Fulfills LER Social Sciences
Semester Three: [16 Credit Hours]				
EDPF 29525 Educational Psychology	3		C	
PHY 23101 General University Physics I	5		C	
ENG 21011 College Writing II	3		C	Fulfills LER Composition
MATH 12002 Analytical Geometry and Calculus I	5			
Semester Four: [17 Credit Hours]				
MATH 12003 Analytic Geometry and Calculus II	5		C	
PHY 23102 General University Physics II	5		C	
BSCI 10110 Biological Diversity	4		C	
PHIL 11001 Introduction to Philosophy	3			Fulfills LER Humanities and global diversity course requirement
Semester Five: [17 Credit Hours]				
Requirement:: minimum 2.75 cumulative GPA by end of term				
BSCI 10120 Biological Foundations	4		C	
CHEM 10030 Chemistry in the World DELETE	3		C	Change to "Choose ONE LER Humanities"
COMM 26000 Criticism of Public Discourse	3			Fulfills LER Humanities
GEOL 11040 Earth Dynamics	3			Fulfills LER Basic Sciences
GEOL 11041 Earth Dynamics Laboratory	1			Fulfills LER Basic Sciences
PHY 21430 Frontiers in Astronomy *or* PHY 24001 Astronomy	3		C	
Add CHEM 20481 Basic Organic Chemistry	4		C	

13 HR

18 HR

Edited 2009 ISCI-PHY

KENT STATE UNIVERSITY

Roadmap: Integrated Science - Physics - Bachelor of Science in Education
[EH-BSE-ISCI-PHY]
College of Education, Health and Human Services
School of Teaching, Learning and Curriculum Studies
Catalog Year: 2009-2010

Semester Six: [18 Credit Hours]				
Requirement:: apply and be accepted for Advanced Study; minimum 2.75 cumulative GPA				
PHY 30020 Intermediate Physics Laboratory	2	■	C	
GEOG 41073 Conservation of Natural Resource	3	■	C	
GEOL 11042 Earth History	3		C	
GEOL 11043 Earth History Laboratory	1		C	
SOC 22778 Social Problems DELETE	3			Fulfills LER Additional
SPED 23000 Introduction to Exceptionalities	3		C	Fulfills domestic diversity course requirement
LER Fine Arts	3			Visit www.kent.edu/catalog and search "LER" for course listing
Semester Seven: [16 Credit Hours]				
Requirement:: apply for student teaching				
ADED 32142 Principles of Teaching Adolescents	3	■	C	Fulfills writing-intensive course requirement; offered in fall only
ITEC 19525 Educational Technology	3		C	
CI 47330 Reading and Writing in Adolescence	3	■	C	
GEOG 31062 Fundamentals of Meteorology	3	■	C	
PHY 32511 Electronics or PHY 36002 Applications of Modern Physics				
Semester Eight: [16 Credit Hours]				
ADED 32277 Teaching Science in Secondary Schools	3	■	C	Offered in spring only
BSCI 30140 Cell Biology	4	■	C	
BSCI 30156 Elements of Genetics	3	■	C	
MATH 10041 Elementary Probability and Statistics *or* MATH 30011 Basic Probability and Statistics	3			
PHY 36001 Modern Physics I	3	■	C	
Semester Nine: [16 Credit Hours]				
ADED 42277 Topics in Secondary School Science	3	■	C	
ADED 42292 Field Work Practicum	3	■	C	
CHEM 40567 Basic Concepts of Physical Chemistry	4	■	C	
GEOL 41025 General Geophysics DELETE	3	■	C	
PHY 11030 Seven Ideas that Shook the Universe DELETE	3			Fulfills LER Basic Sciences
Semester Ten: [12 Credit Hours]				
ADED 42357 Secondary Student Teaching	9	■	S	
ADED 49525 Inquiry into Professional Practice	3	■	C	

Graduation Requirements Summary

Total Hours	Upper-Division Hours	Liberal Education Requirements Hours	Diversity Course Global / Domestic
150 / 148	38 / 49	36	PHIL 11001 / SPED 23000

Special Notes for Degree/Major:

1. Pass Praxis II "Principles of Learning and Teaching" and specialty test.
2. Apply for teaching license (pick up licensure packet in 304 White Hall).

Liberal Education Requirements (LER)

Students must complete a minimum 36 credit hours of Liberal Education Requirements certain courses to fulfill the requirements. Courses in the students' major field will not c equivalents shall satisfy the LER. None of the courses on the LER list may be taken wi

Diversity Course Requirement
Students must complete a two-course diversity requirement, consisting of one with a domestic focus and one with a global focus. One course must be come from the LER and cannot be in the student's major. The second course may be taken as a second LER; or within a major or minor; or as a general elective; or, with dean's approval, by completing one semester of study in another country.

Writing-Intensive Course Requirement
Students must complete a one-course writing-intensive requirement in their major and earn minimum C (2.00) grade.

Upper-Division Requirement
In general, baccalaureate programs require the successful completion of at least 39 upper-division (numbered 30000 to 49999) credit hours of coursework. Programs in the College of Arts and Sciences require a minimum of 42 hours of upper-division coursework.

KENT STATE UNIVERSITY

Roadmap: Integrated Science - Physics - Bachelor of Science in Education

[EH-BSE-ISCI-PHY]
College of Education, Health, and Human Services
School of Teaching, Learning, and Curriculum Studies
Catalog Year: 2010-2011

Critical requirements are boldface in shaded areas

Course Subject and Title	Credit Hours	Upper Division	Min. Grade	Important Notes
Semester One: [15 Credit Hours]				
US 10097 FYE FLASH Point	1			
MATH 11010 Algebra for Calculus	3			
ENG 11011 College Writing 1	3			
PSYCH 11762 General Psychology	3			
CHEM 10060 General Chemistry 1	4		C	
CHEM 10062 Chemistry Lab 1	1		C	
Semester Two: [13 Credit Hours]				
MATH 11022 Trigonometry	2			
SOC 12050 Intro to Sociology	3			
EDPF 29535 Ed. in a Democratic Society	3		C	
CHEM 10061 General Chemistry II	4		C	
CHEM 10063 Chemistry Lab II	1		C	
Semester Three: [17 Credit Hours]				
MATH 12002 Analytical Geom. & Calc 1	5			
CHEM 20481 Basic Organic Chemistry I	4		C	
ENG 21011 College Writing II	3			
PHY 23101 General University Phys I	5		C	
Semester Four: [17 Credit Hours]				
MATH 12003 Analytical Geom. & Calc II	5			
PHIL 11001 Introduction to Philosophy	3			
PHY 23102 General University Phys II	5		C	
BSCI 10110 Bio Diversity	4		C	
Semester Five: [17 Credit Hours]				
GEOL 11040 Earth Dynamics	3		C	
GEOL 11041 Earth Dynamics Lab	1		C	
BSCI 10120 Bio Foundations	4		C	
EDPF 29525 Educational Psychology	3		C	
Humanities LER	3			
PHY 21430 Frontiers in Astronomy	3		C	
Semester Six: [15 Credit Hours]				
GEOL 10042 Earth History	3		C	
GEOL 10043 Earth History Lab	1		C	
PHY 30020 Intermed. Physics Lab	2	•	C	
GEOG 41073 Conservation of Nat. Res.	3	•	C	
SPED 23000 Intro. to Exceptionalities	3		C	

Word Course ISCI-PHY

Course Subject and Title	Credit Hours	Upper Division	Min. Grade	Important Notes
Fine Art LER	3			
Semester Seven: [12 Credit Hours]				
ITEC 19525 Educational Technology	3		C	
ADED 32142 Princ. Of Teaching Adol.	3	•	C	
GEOG 31062 Meteorology	3	•	C	
C&I 47330 Reading & Writing in ADED	3	•	C	
Semester Eight: [16 Credit Hours]				
ADED 32277 Teach Science in Sec Sch	3	•	C	
MATH 10041 or 30011 Prob & Stats	3			
PHY 36001 Modern Physics I	3	•	C	
BSCI 20140 Cell Biology	4		C	
BSCI 30156 Elements of Genetics	3	•	C	
Semester Nine: [14 Credit Hours]				
ADED 42277 Topics in Sec Sch Science	3	•	C	
ADED 42292 Field Work Practicum	3	•	C	
PHY 32511/PHY 36002 Electronics/App of Mod Phys	4	•	C	
CHEM 40567 Basic Conc. of Phys Chem	4	•	C	
Semester Ten: [12 Credit Hours]				
ADED 49525 Inq into Professional Prac	3	•	S	
ADED 42357 Student Teaching	9	•	C	

Graduation Requirements Summary

Minimum Total Hours	Upper-Division Hours	Liberal Education Requirements Hours	Diversity Course Global / Domestic	Writing-Intensive	Minimum Major GPA	Minimum Overall GPA
148	49	36	PHIL 11001/SPED 23000	ADED 32142	2.6	2.75

Additional Notes for the XXX program: [IF ANY]

-
-
-

Liberal Education Requirements (LER)
Students must complete a minimum 36 credit hours of Liberal Education Requirements. Colleges or degree programs may specify certain courses to fulfill the requirements. Courses in the students' major field will not count toward the completion of any LER. Honors equivalents shall satisfy the LER. None of the courses on the LER list may be taken with a pass/fail grade.

Diversity Course Requirement

Students must complete a two-course diversity requirement, consisting of one with a domestic focus and one with a global focus. One course must be come from the LER and cannot be in the student's major. The second course may be taken as a second LER; or within a major or minor; or as a general elective; or, with dean's approval, by completing one semester of study in another country.

Writing-Intensive Course Requirement

Students must complete a one-course writing-intensive requirement in their major and earn minimum C (2.00) grade.

Upper-Division Requirement

In general, baccalaureate programs require the successful completion of at least 39 upper-division (numbered 30000 to 49999) credit hours of coursework. Programs in the College of Arts and Sciences require a minimum of 42 hours of upper-division coursework.

Integrated Science – Earth Science Emphasis NCATE Competencies & Courses that Meet Them

Competency Requirements for All Science Teachers*

A: Competency (numbers 1-5)	B: Required Courses or advising requirements
1. Multiple ways we organize our perceptions of the world and how systems organize the studies and knowledge of science.	ADED 32277 Teaching Science in Secondary Schools
2. Nature of scientific evidence and the use of models for explanation.	ADED 32277 Teaching Science in Secondary Schools
3. Measurement as a way of knowing and organizing observations of constancy and change.	GEOL 11043 Earth History Lab CHEM 10063 Chemistry Lab II ADED 42277 Topics in Secondary School Science
4. Evolution of natural systems and factors that result in evolution or equilibrium.	GEOL 11042 Earth History CHEM 10061 General Chemistry II BSCI 10110 Biological Diversity
5. Interrelationships of form, function, and behaviors in living and nonliving systems.	GEOL 11040 Earth Dynamics BSCI 10110 Biological Diversity PHY 24001 Astronomy or PHY 21430 Frontiers in Astronomy

Science Content Requirement Analysis Tables I, II, III for Biology

Table I: Biology (Core Competencies)

A. Core Competencies (numbers 1-12)	B: Required Courses or advising requirements
1. Life processes in living systems including organization of matter and energy.	BSCI 10120 Biological Foundations
2. Similarities and differences among animals, plants, fungi, microorganisms, and viruses	BSCI 10110 Biological Diversity
3. Principles and practices of biological classification	BSCI 10110 Biological Diversity
4. Theory and principles of biological evolution	BSCI 10110 Biological Diversity
5. Ecological systems including the interrelationships and dependencies of organisms with each other and their environments.	BSCI 10110 Biological Diversity BSCI 10120 Biological Foundations
6. Population dynamics and the impact of population on its environment.	BSCI 10110 Biological Diversity
7. General concepts of genetics and heredity	BSCI 30156 Elements of Genetics
8. Organizations and functions of cells and multi-cellular systems.	BSCI 10120 Biological Foundations BSCI 20140 Cell Biology
9. Behavior of organisms and their relationships to social systems.	BSCI 10110 Biological Diversity
10. Regulation of biological systems including homeostatic mechanisms	BSCI 10120 Biological Foundations
11. Fundamental processes of modeling and investigating in the biological sciences	BSCI 10110 Biological Diversity (lab component) BSCI 10120 Biological Foundations (lab component)
12. Applications of biology in environmental quality and in personal and community health	GEOG 41073 Conservation of Natural Resources

Table III: Biology Supporting Competencies

C. Supporting Competencies	B: Required Courses or advising requirements
13. General Chemistry	CHEM 10060 General Chemistry I CHEM 10061 General Chemistry II
14. Biochemistry	CHEM 30284 Introduction to Biochemistry CHEM 20481 Basic Organic Chemistry I
15. Basic chemistry laboratory techniques	CHEM 10062 General Chemistry Lab I CHEM 10063 General Chemistry Lab II
Physics	
16. Light	PHY 13002 General College Physics II
17. Sound	PHY 13001 General College Physics I
18. Optics	PHY 13002 General College Physics II
19. Electricity	PHY 13002 General College Physics II
20. Energy and order	PHY 13001 General College Physics I
21. Magnetism	PHY 13002 General College Physics II
22. Thermodynamics	PHY 13001 General College Physics I
Earth and space sciences	
23. Energy and geochemical cycles	GEOL 11040 Earth Dynamics GEOG 31062 Meteorology
24. Climate	GEOL 11040 Earth Dynamics GEOL 11042 Earth History GEOG 31062 Meteorology
25. Oceans	GEOL 11042 Earth History
26. Weather	GEOG 31062 Meteorology
27. Natural resources	GEOG 41073 Conservation of Natural Resources GEOL 11040 Earth Dynamics
28. Changes in the Earth	GEOL 11042 Earth History GEOL 11043 Earth History Lab
Mathematics	MATH 11010 Algebra for Calculus MATH 11022 Trigonometry MATH 12002 Analytic Geometry & Calculus I
29. Probability	MATH 10041 Elementary Probability and Statistics OR MATH 30011 Basic Probability and Statistics
30. Statistics	MATH 10041 Elementary Probability and Statistics OR MATH 30011 Basic Probability and Statistics

Science Content Requirement Analysis Tables I, II, III for Chemistry
Table I: Chemistry

A. Core Competencies (numbers 1-13)	B: Required Courses or advising requirements
1. Fundamental structures of atoms and molecules	CHEM 10060 General Chemistry I CHEM 10062 General Chemistry Lab I
2. Basic principles of ionic, covalent, and metallic bonding	CHEM 10060 General Chemistry I CHEM 10062 General Chemistry Lab I
3. Physical and chemical properties and classification of elements including periodicity	CHEM 10060 General Chemistry I CHEM 10062 General Chemistry Lab I
4. Chemical kinetics and thermodynamics	CHEM 10061 General Chemistry II CHEM 10063 General Chemistry Lab II
5. Principles of electrochemistry	CHEM 10061 General Chemistry II CHEM 10063 General Chemistry Lab II
6. Mole concept, stoichiometry, and laws of composition	CHEM 10060 General Chemistry I CHEM 10062 General Chemistry Lab I
7. Transition elements and coordination compounds	CHEM 30301 Inorganic Chemistry I
8. Acids and bases, oxidation-reduction chemistry, and solutions	CHEM 10061 General Chemistry II CHEM 10063 General Chemistry Lab II
9. Fundamental biochemistry	CHEM 30284 Introduction to Biological Chemistry CHEM 20481 Basic Organic Chemistry I
10. Functional and polyfunctional group chemistry	CHEM 20481 Basic Organic Chemistry I CHEM 10061 General Chemistry II
11. Environmental and atmospheric chemistry	
12. Fundamental processes of investigating in chemistry	CHEM 10062 General Chemistry Lab I CHEM 10063 General Chemistry Lab II
13. Applications of chemistry in personal and community health and environmental quality	ADED 42277 Topics in Secondary School Science

Table III: Chemistry (Supporting Competencies)

C. Supporting Competencies (numbers 28-44)	B: Required Courses or advising requirements
1. Biology	BSCI 10120 Biological Foundations BSCI 10110 Biological Diversity
2. Molecular biology	BSCI 10120 Biological Foundations BSCI 30156 Elements of Genetics
3. Bioenergetics	BSCI 10120 Biological Foundations
4. Ecology	BSCI 10110 Biological Diversity
Earth science	
5. Geochemistry	
6. Cycles of matter	GEOL 11040 Earth Dynamics GEOG 31062 Meteorology
7. Energetics of Earth systems	GEOL 11040 Earth Dynamics
Physics	
8. Energy	PHY 13001 General College Physics I
9. Stellar evolution	PHY 24001 Astronomy or PHY 21430 Frontiers in Astronomy
10. Properties and function of waves	PHY 13002 General College Physics II
11. Properties and function of motions	PHY 13001 General College Physics I
12. Properties and function of forces	PHY 13001 General College Physics I
13. Electricity	PHY 13002 General College Physics II
14. Magnetism	PHY 13002 General College Physics II
Mathematical and statistical concepts	MATH 11010 Algebra for Calculus MATH 11022 Trigonometry MATH 12002 Analytic Geometry & Calculus I
15. Statistics	MATH 10041 Elementary Probability and Statistics OR MATH 30011 Basic Probability and Statistics
16. Use of differential equations	MATH 12002 Analytic Geometry & Calculus I **(basic)**
17. Calculus	MATH 12002 Analytic Geometry & Calculus I

Science Content Requirement Analysis Tables I, II, III for the Earth/Space Sciences

Table I: Earth/Space science (Core Competencies)

A. Core Competencies (numbers 1-12)	B: Required Courses or advising requirements
1. Characteristics of land, atmosphere, and ocean systems on Earth	GEOL 11040 Earth Dynamics
2. Properties, measurement, and classification of Earth materials	GEOL 11041 Earth Dynamics Lab
3. Changes in the Earth including land formation and erosion	GEOL 11042 Earth History
4. Geochemical cycles including biotic and abiotic systems	GEOL 11040 Earth Dynamics GEOL 11042 Earth History
5. Energy flow and transformation in Earth systems	GEOL 11040 Earth Dynamics
6. Hydrological features of the Earth	GEOL 11040 Earth Dynamics GEOL 11041 Earth Dynamics Lab
7. Patterns and changes in the atmosphere, weather, and climate	GEOG 31062 Meteorology
8. Origin, evolution, and planetary behaviors of Earth	GEOL 11042 Earth History
9. Origin, evolution, and properties of the universe	GEOL 11042 Earth History PHY 24001 Astronomy OR PHY 21430 Frontiers in Astronomy
10. Fundamental processes of investigating in the Earth and space sciences	GEOL 11041 Earth Dynamics Lab GEOL 11043 Earth History Lab
11. Sources and limits of natural resources	GEOG 41073 Conservation of Natural Resources
12. Applications of Earth and space sciences to environmental quality and to personal and community health and welfare.	GEOG 31062 Meteorology

Table II: Earth/Space Science (Advanced Competencies)

B. Advanced Competencies (numbers 13-22)	B: Required Courses and advising requirements
13. Gradual and catastrophic changes in the Earth	GEOL 11042 Earth History GEOL 32066 Geomorphology
14. Oceans and their relationship to changes in atmosphere and climate.	GEOL 21080 Oceanography GEOG 31062 Meteorology
15. Hydrological cycles and problems of distribution and use of water	GEOL 21080 Oceanography GEOG 31062 Meteorology
16. Dating of the Earth and other objects in the universe	GEOL 11042 Earth History GEOL 11043 Earth History Lab PHY 24001 Astronomy OR PHY 21430 Frontiers in Astronomy
17. Structures and interactions of energy and matter in the universe	PHY 24001 Astronomy OR PHY 21430 Frontiers in Astronomy GEOL 23063 Mineralogy
18. Impact of changes in the Earth on the evolution and distribution of living things.	GEOL 11042 Earth History
19. Issues related to changes in Earth Systems such as global climate change, mine subsidence, and channeling of waterways.	GEOG 31062 Meteorology GEOL 11040 Earth Dynamics GEOL 11041 Earth Dynamics Lab GEOG 41073 Conservation of Natural Resources
20. Historical development and perspectives, including contributions of significant figures and underrepresented groups, and the evolution of theories in the Earth and space sciences.	GEOL 11042 Earth History GEOL 11043 Earth History Lab
21. How to design, conduct, and report research in the Earth and space sciences	GEOL 32066 Geomorphology OR GEOL 31070 Petrology GEOL 23063 Mineralogy
22. Applications of the Earth and space sciences and related technologies in society, business, industry, and health fields.	GEOL 31070 Petrology GEOL 23063 Mineralogy

Table III: Earth/Space Science

C. Supporting Competencies (numbers 23-43)	B: Required Courses and advised requirements
Biology	
23. Evolution	BSCI 10110 Biological Diversity
24. Ecology	BSCI 10110 Biological Diversity
25. Population dynamics	BSCI 10110 Biological Diversity
26. Flow of energy	BSCI 10120 Biological Foundations
27. Flow of material through earth systems	BSCI 10120 Biological Foundations BSCI 10110 Biological Diversity
Chemistry	
28. Broad concepts of inorganic chemistry	CHEM 10060 General Chemistry I CHEM 10061 General Chemistry II
29. Basic laboratory techniques of inorganic chemistry	CHEM 10062 General Chemistry Lab I CHEM 10063 General Chemistry Lab II
30. Broad concepts of organic chemistry	CHEM 10061 General Chemistry II CHEM 20481 Basic Organic Chemistry I
31. Basic laboratory techniques of organic chemistry	
32. Physical chemistry	CHEM 10060 General Chemistry I CHEM 10061 General Chemistry II
33. Biochemistry	CHEM 20481 Basic Organic Chemistry (very basic biochem)
Physics	
34. Electricity	PHY 13002 General College Physics II
35. Forces and motion	PHY 13001 General College Physics I
36. Energy	PHY 13001 General College Physics I
37. Magnetism	PHY 13002 General College Physics II
38. Thermodynamics	PHY 13001 General College Physics I
39. Optics	PHY 13002 General College Physics II
40. Sound	PHY 13001 General College Physics I
41. Basic quantum theory	PHY 13002 General College Physics II
Mathematics	MATH 11010 Algebra for Calculus MATH 11022 Trigonometry MATH 12002 Analytic Geometry & Calculus I
42. Statistics	MATH 10041 Elementary Probability and Statistics OR MATH 30011 Basic Probability and Statistics
43. Probability	MATH 10041 Elementary Probability and Statistics OR MATH 30011 Basic Probability and Statistics

Science Content Requirement Analysis Tables I, II, and III for Physics

Table I: Physics (Core Competencies)

A. Core Competencies (numbers 1-11)	B: Required Courses and advised requirements
1. Energy, work, and power	PHY 13001 General College Physics I
2. Motion, major forces, and momentum	PHY 13001 General College Physics I
3. Newtonian physics w/engineering applications	PHY 13001 General College Physics I
4. Conservation mass, momentum, energy, and charge	PHY 13001 General College Physics I PHY 13002 General College Physics II
5. Physical properties of matter	CHEM 10060 General Chemistry I CHEM 10062 General Chemistry Lab I
6. Kinetic-molecular motion and atomic models	PHY 13001 General College Physics I PHY 13002 General College Physics II
7. Radioactivity, nuclear reactors, fission, and fusion	PHY 13002 General College Physics II CHEM 10061 General Chemistry II
8. Wave theory, sound, light, the electromagnetic spectrum and optics	PHY 13001 General College Physics I PHY 13002 General College Physics II
9. Electricity and magnetism	PHY 13002 General College Physics II
10. Fundamental processes of investigating in physics	PHY 13001 General College Physics I PHY 13002 General College Physics II
11. Applications of physics in environmental quality and to personal and community health	ADED 32277 Teaching Science in Secondary Schools

Table III: Physics (Supporting Competencies)

C. Supporting Competencies (numbers 23-38)	B: Required Courses and advising requirements
12. Biology, including organization of life, bioenergetics, biomechanics, and cycles of matter	BSCI 10120 Biological Foundations BSCI 10110 Biological Diversity
13. Organization of life	BSCI 10120 Biological Foundations
14. Bioenergetics	BSCI 10120 Biological Foundations
15. Biomechanics	BSCI 10120 Biological Foundations
16. Cycles of matter	BSCI 10120 Biological Foundations BSCI 10110 Biological Diversity
17. Chemistry	
18. Organization of matter and energy	CHEM 10060 General Chemistry I
19. Electrochemistry	CHEM 10061 General Chemistry II
20. Thermodynamics	CHEM 10061 General Chemistry II
21. Bonding	CHEM 10060 General Chemistry I
Earth sciences and/or astronomy	
22. Structures of the universe	PHY 24001 Astronomy OR PHY 21430 Frontiers in Astronomy
23. Energy	GEOG 31062 Meteorology
24. Interactions of matter	GEOL 11040 Earth Dynamics
Mathematical and statistical concepts and skills	MATH 11010 Algebra for Calculus MATH 11022 Trigonometry
25. Statistics	MATH 10041 Elementary Probability and Statistics OR MATH 30011 Basic Probability and Statistics
26. Use of differential equations	MATH 12002 Analytic Geometry & Calculus I **(basic)**
27. Calculus	MATH 12002 Analytic Geometry & Calculus I

Life Science/ Chemistry NCATE Competencies & the Courses that Meet Them

Competency Requirements for All Science Teachers*

A: Competency (numbers 1-5)	B: Required Courses or advising requirements
1. Multiple ways we organize our perceptions of the world and how systems organize the studies and knowledge of science.	ADED 32277 Teaching Science in Secondary Schools
2. Nature of scientific evidence and the use of models for explanation.	ADED 32277 Teaching Science in Secondary Schools
3. Measurement as a way of knowing and organizing observations of constancy and change.	CHEM 10063 Chemistry Lab II ADED 42277 Topics in Secondary School Science
4. Evolution of natural systems and factors that result in evolution or equilibrium.	CHEM 10061 General Chemistry II BSCI 10110 Biological Diversity
5. Interrelationships of form, function, and behaviors in living and nonliving systems.	GEOL 11040 Earth Dynamics BSCI 10110 Biological Diversity

Science Content Requirement Analysis Tables I, II, III for Biology

Table I: Biology (Core Competencies)

A. Core Competencies (numbers 1-12)	B: Required Courses or advising requirements
1. Life processes in living systems including organization of matter and energy.	BSCI 10120 Biological Foundations
2. Similarities and differences among animals, plants, fungi, microorganisms, and viruses	BSCI 10110 Biological Diversity
3. Principles and practices of biological classification	BSCI 10110 Biological Diversity
4. Theory and principles of biological evolution	BSCI 10110 Biological Diversity
5. Ecological systems including the interrelationships and dependencies of organisms with each other and their environments.	BSCI 10110 Biological Diversity BSCI 10120 Biological Foundations
6. Population dynamics and the impact of population on its environment.	BSCI 10110 Biological Diversity
7. General concepts of genetics and heredity	BSCI 30156 Elements of Genetics
8. Organizations and functions of cells and multi-cellular systems.	BSCI 10120 Biological Foundations BSCI 20140 Cell Biology
9. Behavior of organisms and their relationships to social systems.	BSCI 10110 Biological Diversity
10. Regulation of biological systems including homeostatic mechanisms	BSCI 10120 Biological Foundations
11. Fundamental processes of modeling and investigating in the biological sciences	BSCI 10110 Biological Diversity (lab component) BSCI 10120 Biological Foundations (lab component)
12. Applications of biology in environmental quality and in personal and community health	ADED 42277 Topics in Secondary School Science

Table II: Biology (Advanced Competencies)

B. Advanced Competencies (numbers 13-21)	B: Required Courses or advising requirements
13. Bioenergetics including major biochemical pathways	CHEM 30284 Introduction to Biological Chemistry
14. Biochemical interactions of organisms and their environments	CHEM 30284 Introduction to Biological Chemistry
15. Molecular genetics and heredity and mechanisms of genetic modification	BSCI 30156 Elements of Genetics
16. Molecular basis for evolutionary theory and classification	BSCI 30156 Elements of Genetics BSCI 40163 Organic Evolution
17. Causes, characteristics, and avoidance of viral, bacterial, and parasitic diseases	BSCI 20140 Cell Biology
18. Issues related to living systems such as genetic modification, uses of biotechnology, cloning, and pollution from farming.	ADED 32277 Teaching Science in Secondary Schools BSCI 20140 Cell Biology BSCI 40163 Organic Evolution
19. Historical development and perspectives in biology including contributions of significant figures and underrepresented groups, and the evolution of theories in biology	ADED 32277 Teaching Science in Secondary Schools BSCI 40163 Organic Evolution
20. How to design, conduct, and report research in biology	BSCI 20140 Cell Biology
21. Applications of biology and biotechnology in society, business, industry, and health fields	ADED 42277 Topics in Secondary School Science BSCI 20140 Cell Biology

Table III: Biology Supporting Competencies

C. Supporting Competencies	B: Required Courses or advising requirements
22. General Chemistry	CHEM 10060 General Chemistry I CHEM 10061 General Chemistry II
23. Biochemistry	CHEM 30284 Introduction to Biochemistry CHEM 20481 Basic Organic Chemistry I
24. Basic chemistry laboratory techniques	CHEM 10062 General Chemistry Lab I CHEM 10063 General Chemistry Lab II
Physics	
25. Light	PHY 13002 General College Physics II
26. Sound	PHY 13001 General College Physics I
27. Optics	PHY 13002 General College Physics II
28. Electricity	PHY 13002 General College Physics II
29. Energy and order	PHY 13001 General College Physics I
30. Magnetism	PHY 13002 General College Physics II
31. Thermodynamics	PHY 13001 General College Physics I
Earth and space sciences	
32. Energy and geochemical cycles	GEOL 11040 Earth Dynamics
33. Climate	GEOL 11040 Earth Dynamics
34. Oceans	
35. Weather	
36. Natural resources	GEOL 11040 Earth Dynamics **[1, 2, 3, 4]**
37. Changes in the Earth	
Mathematics	MATH 11010 Algebra for Calculus **[1, 2, 3, 4, 5, 6]** MATH 11022 Trigonometry **[1, 2, 3, 4, 5, 6]** MATH 12002 Analytic Geometry & Calculus I **[1, 2, 3, 4, 5, 6]**
38. Probability	MATH 10041 Elementary Probability and Statistics OR MATH 30011 Basic Probability and Statistics **[1, 2, 3, 4, 5, 6]**
39. Statistics	MATH 10041 Elementary Probability and Statistics OR MATH 30011 Basic Probability and Statistics **[1, 2, 3, 4, 5, 6]**

Science Content Requirement Analysis Tables I, II, III for Chemistry
Table I: Chemistry

A. Core Competencies (numbers 1-13)	B: Required Courses or advising requirements
1. Fundamental structures of atoms and molecules	CHEM 10060 General Chemistry I CHEM 10062 General Chemistry Lab I
2. Basic principles of ionic, covalent, and metallic bonding	CHEM 10060 General Chemistry I CHEM 10062 General Chemistry Lab I
3. Physical and chemical properties and classification of elements including periodicity	CHEM 10060 General Chemistry I CHEM 10062 General Chemistry Lab I
4. Chemical kinetics and thermodynamics	CHEM 10061 General Chemistry II CHEM 10063 General Chemistry Lab II
5. Principles of electrochemistry	CHEM 10061 General Chemistry II CHEM 10063 General Chemistry Lab II
6. Mole concept, stoichiometry, and laws of composition	CHEM 10060 General Chemistry I CHEM 10062 General Chemistry Lab I
7. Transition elements and coordination compounds	CHEM 30301 Inorganic Chemistry I
8. Acids and bases, oxidation-reduction chemistry, and solutions	CHEM 10061 General Chemistry II CHEM 10063 General Chemistry Lab II
9. Fundamental biochemistry	CHEM 30284 Introduction to Biological Chemistry CHEM 20481 Basic Organic Chemistry I
10. Functional and polyfunctional group chemistry	CHEM 20481 Basic Organic Chemistry I CHEM 10061 General Chemistry II
11. Environmental and atmospheric chemistry	
12. Fundamental processes of investigating in chemistry	CHEM 10062 General Chemistry Lab I CHEM 10063 General Chemistry Lab II
13. Applications of chemistry in personal and community health and environmental quality	ADED 42277 Topics in Secondary School Science

Table II: Chemistry (Advanced Competencies)

B. Advanced Competencies (numbers 14-27)	B: Required Courses or advising requirements
14. Molecular orbital theory, aromaticity, metallic and ionic structures, and correlation to properties of matter	CHEM 10060 General Chemistry I CHEM 20481 Basic Organic Chemistry I CHEM 30301 Inorganic Chemistry
15. Superconductors and principles of metallurgy	CHEM 10061 General Chemistry II (superconductors)
16. Advanced concepts of chemical kinetics, and thermodynamics	
17. Lewis adducts and coordination compounds	CHEM 10061 General Chemistry II CHEM 30301 Inorganic Chemistry I
18. Solutions, colloids, and colligative properties	CHEM 10061 General Chemistry II CHEM 30301 Inorganic Chemistry I
19. Major biological compounds and natural products	CHEM 30284 Introduction to Biological Chemistry
20. Solvent system concepts including non-aqueous solvents	CHEM 30301 Inorganic Chemistry I CHEM 30105 Analytical Chemistry I CHEM 20481 Basic Organic Chemistry I
21. Chemical reactivity and molecular structure including electronic and steric effects	CHEM 20481 Basic Organic Chemistry I CHEM 30284 Introduction to Biochemistry
22. Organic synthesis and organic reaction mechanisms	CHEM 20481 Basic Organic Chemistry I CHEM 30475 Organic Chemistry Lab
23. Energy flow through chemical systems	CHEM 30284 Introduction to Biological Chemistry
24. Issues related to chemistry including ground water pollution, disposal of plastics, and development of alternative fuels.	ADED 32277 Teaching Science in Secondary Schools
25. Historical development and perspectives in chemistry including contributions of significant figures and underrepresented groups, and the evolution of theories in chemistry	ADED 32277 Teaching Science in Secondary Schools
26. How to design, conduct, and report research in chemistry	CHEM 10062 General Chemistry Lab I CHEM 10063 General Chemistry Lab II CHEM 30475 Organic Chemistry Lab
27. Applications of chemistry and chemical technology in society, business, industry, and health fields	ADED 42277 Topics in Secondary School Science

Table III: Chemistry (Supporting Competencies)

C. Supporting Competencies (numbers 28-44)	B: Required Courses or advising requirements
1. Biology	BSCI 10120 Biological Foundations BSCI 10110 Biological Diversity
2. Molecular biology	BSCI 10120 Biological Foundations BSCI 30156 Elements of Genetics
3. Bioenergetics	BSCI 10120 Biological Foundations
4. Ecology	BSCI 10110 Biological Diversity
Earth science	
5. Geochemistry	
6. Cycles of matter	GEOL 11040 Earth Dynamics
7. Energetics of Earth systems	GEOL 11040 Earth Dynamics
Physics	
8. Energy	PHY 13001 General College Physics I
9. Stellar evolution	
10. Properties and function of waves	PHY 13002 General College Physics II
11. Properties and function of motions	PHY 13001 General College Physics I
12. Properties and function of forces	PHY 13001 General College Physics I
13. Electricity	PHY 13002 General College Physics II
14. Magnetism	PHY 13002 General College Physics II
Mathematical and statistical concepts	MATH 11010 Algebra for Calculus MATH 11022 Trigonometry MATH 12002 Analytic Geometry & Calculus I
15. Statistics	MATH 10041 Elementary Probability and Statistics OR MATH 30011 Basic Probability and Statistics
16. Use of differential equations	MATH 12002 Analytic Geometry & Calculus I **(basic)**
17. Calculus	MATH 12002 Analytic Geometry & Calculus I

Earth Science (ESCI) NCATE Competencies & the Classes that Meet Them

Competency Requirements for *All* Science Teachers*

A: Competency (numbers 1-5)	B: Required Courses or advising requirements
1. Multiple ways we organize our perceptions of the world and how systems organize the studies and knowledge of science.	ADED 32277 Teaching Science in Secondary Schools
2. Nature of scientific evidence and the use of models for explanation.	ADED 32277 Teaching Science in Secondary Schools
3. Measurement as a way of knowing and organizing observations of constancy and change.	GEOL 11043 Earth History Lab CHEM 10063 Chemistry Lab II ADED 42277 Topics in Secondary School Science
4. Evolution of natural systems and factors that result in evolution or equilibrium.	GEOL 11042 Earth History CHEM 10061 General Chemistry II BSCI 10110 Biological Diversity
5. Interrelationships of form, function, and behaviors in living and nonliving systems.	GEOL 11040 Earth Dynamics BSCI 10110 Biological Diversity PHY 24001 Astronomy or PHY 21430 Frontiers in Astronomy

Science Content Requirement Analysis Tables I, II, III for the Earth/Space Sciences

Table I: Earth/Space science (Core Competencies)

A. Core Competencies (numbers 1-12)	B: Required Courses or advising requirements
1. Characteristics of land, atmosphere, and ocean systems on Earth	GEOL 11040 Earth Dynamics
2. Properties, measurement, and classification of Earth materials	GEOL 11041 Earth Dynamics Lab
3. Changes in the Earth including land formation and erosion	GEOL 11042 Earth History
4. Geochemical cycles including biotic and abiotic systems	GEOL 11040 Earth Dynamics GEOL 11042 Earth History
5. Energy flow and transformation in Earth systems	GEOL 11040 Earth Dynamics
6. Hydrological features of the Earth	GEOL 11040 Earth Dynamics GEOL 11041 Earth Dynamics Lab
7. Patterns and changes in the atmosphere, weather, and climate	GEOG 31062 Meteorology
8. Origin, evolution, and planetary behaviors of Earth	GEOL 11042 Earth History
9. Origin, evolution, and properties of the universe	GEOL 11042 Earth History PHY 24001 Astronomy OR PHY 21430 Frontiers in Astronomy
10. Fundamental processes of investigating in the Earth and space sciences	GEOL 11041 Earth Dynamics Lab GEOL 11043 Earth History Lab
11. Sources and limits of natural resources	GEOG 41073 Conservation of Natural Resources
12. Applications of Earth and space sciences to environmental quality and to personal and community health and welfare.	GEOG 31062 Meteorology GEOG 41082 Geography of Soils

Table II: Earth/Space Science (Advanced Competencies)

B. Advanced Competencies (numbers 13-22)	B: Required Courses and advising requirements
13. Gradual and catastrophic changes in the Earth	GEOL 11042 Earth History GEOL 32066 Geomorphology
14. Oceans and their relationship to changes in atmosphere and climate.	GEOL 21080 Oceanography GEOG 31062 Meteorology GEOG 31064 Principles of Climatology
15. Hydrological cycles and problems of distribution and use of water	GEOL 21080 Oceanography GEOG 31062 Meteorology
16. Dating of the Earth and other objects in the universe	GEOL 11042 Earth History GEOL 11043 Earth History Lab PHY 24001 Astronomy OR PHY 21430 Frontiers in Astronomy
17. Structures and interactions of energy and matter in the universe	PHY 24001 Astronomy OR PHY 21430 Frontiers in Astronomy GEOL 23063 Mineralogy
18. Impact of changes in the Earth on the evolution and distribution of living things.	GEOL 11042 Earth History
19. Issues related to changes in Earth Systems such as global climate change, mine subsidence, and channeling of waterways.	GEOG 31062 Meteorology GEOG 31064 Principles of Climatology GEOL 11040 Earth Dynamics GEOL 11041 Earth Dynamics Lab GEOG 41073 Conservation of Natural Resources
20. Historical development and perspectives, including contributions of significant figures and underrepresented groups, and the evolution of theories in the Earth and space sciences.	GEOL 11042 Earth History GEOL 11043 Earth History Lab
21. How to design, conduct, and report research in the Earth and space sciences	GEOL 32066 Geomorphology OR GEOL 31070 Petrology GEOL 23063 Mineralogy
22. Applications of the Earth and space sciences and related technologies in society, business, industry, and health fields.	GEOL 31070 Petrology GEOL 23063 Mineralogy

Table III: Earth/Space Science

C. Supporting Competencies (numbers 23-43)	B: Required Courses and advised requirements
Biology	
23. Evolution	BSCI 10110 Biological Diversity
24. Ecology	BSCI 10110 Biological Diversity
25. Population dynamics	BSCI 10110 Biological Diversity
26. Flow of energy	BSCI 10120 Biological Foundations
27. Flow of material through earth systems	BSCI 10120 Biological Foundations BSCI 10110 Biological Diversity
Chemistry	
28. Broad concepts of inorganic chemistry	CHEM 10060 General Chemistry I CHEM 10061 General Chemistry II
29. Basic laboratory techniques of inorganic chemistry	CHEM 10062 General Chemistry Lab I CHEM 10063 General Chemistry Lab II
30. Broad concepts of organic chemistry	CHEM 10061 General Chemistry II
31. Basic laboratory techniques of organic chemistry	
32. Physical chemistry	CHEM 10060 General Chemistry I CHEM 10061 General Chemistry II
33. Biochemistry	
Physics	
34. Electricity	PHY 13002 General College Physics II
35. Forces and motion	PHY 13001 General College Physics I
36. Energy	PHY 13001 General College Physics I
37. Magnetism	PHY 13002 General College Physics II
38. Thermodynamics	PHY 13001 General College Physics I
39. Optics	PHY 13002 General College Physics II
40. Sound	PHY 13001 General College Physics I
41. Basic quantum theory	PHY 13002 General College Physics II
Mathematics	MATH 11010 Algebra for Calculus MATH 11022 Trigonometry MATH 12002 Analytic Geometry & Calculus I MATH 12003 Calculus II
42. Statistics	MATH 10041 Elementary Probability and Statistics OR MATH 30011 Basic Probability and Statistics
43. Probability	MATH 10041 Elementary Probability and Statistics OR MATH 30011 Basic Probability and Statistics

Integrated Science – Life Science Emphasis NCATE Competencies & Courses that Meet Them

Competency Requirements for All Science Teachers*

A: Competency (numbers 1-5)	B: Required Courses or advising requirements
1. Multiple ways we organize our perceptions of the world and how systems organize the studies and knowledge of science.	ADED 32277 Teaching Science in Secondary Schools
2. Nature of scientific evidence and the use of models for explanation.	ADED 32277 Teaching Science in Secondary Schools
3. Measurement as a way of knowing and organizing observations of constancy and change.	GEOL 11043 Earth History Lab CHEM 10063 Chemistry Lab II ADED 42277 Topics in Secondary School Science
4. Evolution of natural systems and factors that result in evolution or equilibrium.	GEOL 11042 Earth History CHEM 10061 General Chemistry II BSCI 10110 Biological Diversity
5. Interrelationships of form, function, and behaviors in living and nonliving systems.	GEOL 11040 Earth Dynamics BSCI 10110 Biological Diversity PHY 24001 Astronomy or PHY 21430 Frontiers in Astronomy

Science Content Requirement Analysis Tables I, II, III for Biology

Table I: Biology (Core Competencies)

A. Core Competencies (numbers 1-12)	B: Required Courses or advising requirements
1. Life processes in living systems including organization of matter and energy.	BSCI 10120 Biological Foundations
2. Similarities and differences among animals, plants, fungi, microorganisms, and viruses	BSCI 10110 Biological Diversity
3. Principles and practices of biological classification	BSCI 10110 Biological Diversity
4. Theory and principles of biological evolution	BSCI 10110 Biological Diversity
5. Ecological systems including the interrelationships and dependencies of organisms with each other and their environments.	BSCI 10110 Biological Diversity BSCI 10120 Biological Foundations
6. Population dynamics and the impact of population on its environment.	BSCI 10110 Biological Diversity
7. General concepts of genetics and heredity	BSCI 30156 Elements of Genetics
8. Organizations and functions of cells and multi-cellular systems.	BSCI 10120 Biological Foundations BSCI 20140 Cell Biology
9. Behavior of organisms and their relationships to social systems.	BSCI 10110 Biological Diversity
10. Regulation of biological systems including homeostatic mechanisms	BSCI 10120 Biological Foundations
11. Fundamental processes of modeling and investigating in the biological sciences	BSCI 10110 Biological Diversity (lab component) BSCI 10120 Biological Foundations (lab component)
12. Applications of biology in environmental quality and in personal and community health	GEOG 41073 Conservation of Natural Resources ADED 42277 Topics in Secondary School Science

Table II: Biology (Advanced Competencies)

KSU SECONDARY SCIENCE LICENSES WHICH MATCH THIS COMPETENCY REQUIREMENT:

3=INTEGRATED SCIENCE-LIFE SCIENCE EMPHASIS
5=LIFE SCIENCE
6=LIFE SCIENCE/CHEMISTRY

B. Advanced Competencies (numbers 13-21)	B: Required Courses or advising requirements
13. Bioenergetics including major biochemical pathways	CHEM 30284 Introduction to Biological Chemistry
14. Biochemical interactions of organisms and their environments	CHEM 30284 Introduction to Biological Chemistry
15. Molecular genetics and heredity and mechanisms of genetic modification	BSCI 30156 Elements of Genetics
16. Molecular basis for evolutionary theory and classification	BSCI 30156 Elements of Genetics BSCI 40163 Organic Evolution
17. Causes, characteristics, and avoidance of viral, bacterial, and parasitic diseases	BSCI 20140 Cell Biology
18. Issues related to living systems such as genetic modification, uses of biotechnology, cloning, and pollution from farming.	ADED 32277 Teaching Science in Secondary Schools BSCI 20140 Cell Biology BSCI 40163 Organic Evolution GEOG 41073 Conservation of Natural Resources
19. Historical development and perspectives in biology including contributions of significant figures and underrepresented groups, and the evolution of theories in biology	ADED 32277 Teaching Science in Secondary Schools BSCI 40163 Organic Evolution
20. How to design, conduct, and report research in biology	BSCI 20140 Cell Biology
21. Applications of biology and biotechnology in society, business, industry, and health fields	ADED 42277 Topics in Secondary School Science BSCI 20140 Cell Biology

Table III: Biology Supporting Competencies

C. Supporting Competencies	B: Required Courses or advising requirements
22. General Chemistry	CHEM 10060 General Chemistry I CHEM 10061 General Chemistry II
23. Biochemistry	CHEM 30284 Introduction to Biochemistry CHEM 20481 Basic Organic Chemistry I
24. Basic chemistry laboratory techniques	CHEM 10062 General Chemistry Lab I CHEM 10063 General Chemistry Lab II
Physics	
25. Light	PHY 13002 General College Physics II
26. Sound	PHY 13001 General College Physics I
27. Optics	PHY 13002 General College Physics II
28. Electricity	PHY 13002 General College Physics II
29. Energy and order	PHY 13001 General College Physics I
30. Magnetism	PHY 13002 General College Physics II
31. Thermodynamics	PHY 13001 General College Physics I
Earth and space sciences	
32. Energy and geochemical cycles	GEOL 11040 Earth Dynamics GEOG 31062 Meteorology GEOL 21062 Environmental Geology
33. Climate	GEOL 11040 Earth Dynamics GEOL 11042 Earth History GEOG 31062 Meteorology
34. Oceans	GEOL 11042 Earth History
35. Weather	GEOG 31062 Meteorology
36. Natural resources	GEOG 41073 Conservation of Natural Resources GEOL 11040 Earth Dynamics
37. Changes in the Earth	GEOL 11042 Earth History GEOL 11043 Earth History Lab
Mathematics	MATH 11010 Algebra for Calculus MATH 11022 Trigonometry MATH 12002 Analytic Geometry & Calculus I
38. Probability	MATH 10041 Elementary Probability and Statistics OR MATH 30011 Basic Probability and Statistics
39. Statistics	MATH 10041 Elementary Probability and Statistics OR MATH 30011 Basic Probability and Statistics

Science Content Requirement Analysis Tables I, II, III for Chemistry
Table I: Chemistry

A. Core Competencies (numbers 1-13)	B: Required Courses or advising requirements
1. Fundamental structures of atoms and molecules	CHEM 10060 General Chemistry I CHEM 10062 General Chemistry Lab I
2. Basic principles of ionic, covalent, and metallic bonding	CHEM 10060 General Chemistry I CHEM 10062 General Chemistry Lab I
3. Physical and chemical properties and classification of elements including periodicity	CHEM 10060 General Chemistry I CHEM 10062 General Chemistry Lab I
4. Chemical kinetics and thermodynamics	CHEM 10061 General Chemistry II CHEM 10063 General Chemistry Lab II
5. Principles of electrochemistry	CHEM 10061 General Chemistry II CHEM 10063 General Chemistry Lab II
6. Mole concept, stoichiometry, and laws of composition	CHEM 10060 General Chemistry I CHEM 10062 General Chemistry Lab I
7. Transition elements and coordination compounds	CHEM 30301 Inorganic Chemistry 1
8. Acids and bases, oxidation-reduction chemistry, and solutions	CHEM 10061 General Chemistry II CHEM 10063 General Chemistry Lab II
9. Fundamental biochemistry	CHEM 30284 Introduction to Biological Chemistry CHEM 20481 Basic Organic Chemistry I
10. Functional and polyfunctional group chemistry	CHEM 20481 Basic Organic Chemistry I CHEM 10061 General Chemistry II
11. Environmental and atmospheric chemistry	
12. Fundamental processes of investigating in chemistry	CHEM 10062 General Chemistry Lab I CHEM 10063 General Chemistry Lab II
13. Applications of chemistry in personal and community health and environmental quality	ADED 42277 Topics in Secondary School Science

Table III: Chemistry (Supporting Competencies)

C. Supporting Competencies (numbers 28-44)	B: Required Courses or advising requirements
1. Biology	BSCI 10120 Biological Foundations BSCI 10110 Biological Diversity
2. Molecular biology	BSCI 10120 Biological Foundations BSCI 30156 Elements of Genetics
3. Bioenergetics	BSCI 10120 Biological Foundations
4. Ecology	BSCI 10110 Biological Diversity
Earth science	
5. Geochemistry	GEOL 21062 Environmental Geology
6. Cycles of matter	GEOL 11040 Earth Dynamics GEOG 31062 Meteorology
7. Energetics of Earth systems	GEOL 11040 Earth Dynamics
Physics	
8. Energy	PHY 13001 General College Physics I
9. Stellar evolution	PHY 24001 Astronomy or PHY 21430 Frontiers in Astronomy
10. Properties and function of waves	PHY 13002 General College Physics II
11. Properties and function of motions	PHY 13001 General College Physics I
12. Properties and function of forces	PHY 13001 General College Physics I
13. Electricity	PHY 13002 General College Physics II
14. Magnetism	PHY 13002 General College Physics II
Mathematical and statistical concepts	MATH 11010 Algebra for Calculus MATH 11022 Trigonometry MATH 12002 Analytic Geometry & Calculus I
15. Statistics	MATH 10041 Elementary Probability and Statistics OR MATH 30011 Basic Probability and Statistics
16. Use of differential equations	MATH 12002 Analytic Geometry & Calculus I **(basic)**
17. Calculus	MATH 12002 Analytic Geometry & Calculus I

Science Content Requirement Analysis Tables I, II, III for the Earth/Space Sciences

Table I: Earth/Space science (Core Competencies)

A. Core Competencies (numbers 1-12)	B: Required Courses or advising requirements
1. Characteristics of land, atmosphere, and ocean systems on Earth	GEOL 11040 Earth Dynamics
2. Properties, measurement, and classification of Earth materials	GEOL 11041 Earth Dynamics Lab
3. Changes in the Earth including land formation and erosion	GEOL 11042 Earth History
4. Geochemical cycles including biotic and abiotic systems	GEOL 11040 Earth Dynamics GEOL 11042 Earth History
5. Energy flow and transformation in Earth systems	GEOL 11040 Earth Dynamics
6. Hydrological features of the Earth	GEOL 11040 Earth Dynamics GEOL 11041 Earth Dynamics Lab
7. Patterns and changes in the atmosphere, weather, and climate	GEOG 31062 Meteorology
8. Origin, evolution, and planetary behaviors of Earth	GEOL 11042 Earth History
9. Origin, evolution, and properties of the universe	GEOL 11042 Earth History PHY 24001 Astronomy OR PHY 21430 Frontiers in Astronomy
10. Fundamental processes of investigating in the Earth and space sciences	GEOL 11041 Earth Dynamics Lab GEOL 11043 Earth History Lab
11. Sources and limits of natural resources	GEOG 41073 Conservation of Natural Resources
12. Applications of Earth and space sciences to environmental quality and to personal and community health and welfare.	GEOG 31062 Meteorology

Table III: Earth/Space Science

C. Supporting Competencies (numbers 23-43)	B: Required Courses and advised requirements
Biology	
13. Evolution	BSCI 10110 Biological Diversity
14. Ecology	BSCI 10110 Biological Diversity
15. Population dynamics	BSCI 10110 Biological Diversity
16. Flow of energy	BSCI 10120 Biological Foundations
17. Flow of material through earth systems	BSCI 10120 Biological Foundations BSCI 10110 Biological Diversity
Chemistry	
18. Broad concepts of inorganic chemistry	CHEM 10060 General Chemistry I CHEM 10061 General Chemistry II
19. Basic laboratory techniques of inorganic chemistry	CHEM 10062 General Chemistry Lab I CHEM 10063 General Chemistry Lab II
20. Broad concepts of organic chemistry	CHEM 10061 General Chemistry II CHEM 20481 Basic Organic Chemistry I
21. Basic laboratory techniques of organic chemistry	
22. Physical chemistry	CHEM 10060 General Chemistry I CHEM 10061 General Chemistry II
23. Biochemistry	CHEM 20481 Basic Organic Chemistry (very basic biochem)
Physics	
24. Electricity	PHY 13002 General College Physics II
25. Forces and motion	PHY 13001 General College Physics I
26. Energy	PHY 13001 General College Physics I
27. Magnetism	PHY 13002 General College Physics II
28. Thermodynamics	PHY 13001 General College Physics I
29. Optics	PHY 13002 General College Physics II
30. Sound	PHY 13001 General College Physics I
31. Basic quantum theory	PHY 13002 General College Physics II
Mathematics	MATH 11010 Algebra for Calculus MATH 11022 Trigonometry MATH 12002 Analytic Geometry & Calculus I
32. Statistics	MATH 10041 Elementary Probability and Statistics OR MATH 30011 Basic Probability and Statistics
33. Probability	MATH 10041 Elementary Probability and Statistics OR MATH 30011 Basic Probability and Statistics

Science Content Requirement Analysis Tables I, II, and III for Physics

Table I: Physics (Core Competencies)

A. Core Competencies (numbers 1-11)	B: Required Courses and advised requirements
1. Energy, work, and power	PHY 13001 General College Physics I
2. Motion, major forces, and momentum	PHY 13001 General College Physics I
3. Newtonian physics w/engineering applications	PHY 13001 General College Physics I
4. Conservation mass, momentum, energy, and charge	PHY 13001 General College Physics I PHY 13002 General College Physics II
5. Physical properties of matter	CHEM 10060 General Chemistry I CHEM 10062 General Chemistry Lab I
6. Kinetic-molecular motion and atomic models	PHY 13001 General College Physics I PHY 13002 General College Physics II
7. Radioactivity, nuclear reactors, fission, and fusion	PHY 13002 General College Physics II CHEM 10061 General Chemistry II
8. Wave theory, sound, light, the electromagnetic spectrum and optics	PHY 13001 General College Physics I PHY 13002 General College Physics II
9. Electricity and magnetism	PHY 13002 General College Physics II
10. Fundamental processes of investigating in physics	PHY 13001 General College Physics I PHY 13002 General College Physics II
11. Applications of physics in environmental quality and to personal and community health	ADED 32277 Teaching Science in Secondary Schools

Table III: Physics (Supporting Competencies)

C. Supporting Competencies (numbers 23-38)	B: Required Courses and advising requirements
12. Biology, including organization of life, bioenergetics, biomechanics, and cycles of matter	BSCI 10120 Biological Foundations BSCI 10110 Biological Diversity
13. Organization of life	BSCI 10120 Biological Foundations
14. Bioenergetics	BSCI 10120 Biological Foundations
15. Biomechanics	BSCI 10120 Biological Foundations
16. Cycles of matter	BSCI 10120 Biological Foundations BSCI 10110 Biological Diversity
17. Chemistry	
18. Organization of matter and energy	CHEM 10060 General Chemistry I
19. Electrochemistry	CHEM 10061 General Chemistry II
20. Thermodynamics	CHEM 10061 General Chemistry II
21. Bonding	CHEM 10060 General Chemistry I
Earth sciences and/or astronomy	
22. Structures of the universe	PHY 24001 Astronomy OR PHY 21430 Frontiers in Astronomy
23. Energy	GEOG 31062 Meteorology
24. Interactions of matter	GEOL 11040 Earth Dynamics
Mathematical and statistical concepts and skills	MATH 11010 Algebra for Calculus MATH 11022 Trigonometry
25. Statistics	MATH 10041 Elementary Probability and Statistics OR MATH 30011 Basic Probability and Statistics
26. Use of differential equations	MATH 12002 Analytic Geometry & Calculus I **(basic)**
27. Calculus	MATH 12002 Analytic Geometry & Calculus I

Integrated Science – Chemistry Emphasis NCATE Competencies & Courses that Meet Them

Competency Requirements for All Science Teachers*

A: Competency (numbers 1-5)	B: Required Courses or advising requirements
1. Multiple ways we organize our perceptions of the world and how systems organize the studies and knowledge of science.	ADED 32277 Teaching Science in Secondary Schools
2. Nature of scientific evidence and the use of models for explanation.	ADED 32277 Teaching Science in Secondary Schools
3. Measurement as a way of knowing and organizing observations of constancy and change.	GEOL 11043 Earth History Lab CHEM 10063 Chemistry Lab II ADED 42277 Topics in Secondary School Science
4. Evolution of natural systems and factors that result in evolution or equilibrium.	GEOL 11042 Earth History CHEM 10061 General Chemistry II BSCI 10110 Biological Diversity
5. Interrelationships of form, function, and behaviors in living and nonliving systems.	GEOL 11040 Earth Dynamics BSCI 10110 Biological Diversity PHY 24001 Astronomy or PHY 21430 Frontiers in Astronomy

Science Content Requirement Analysis Tables I, II, III for Biology

Table I: Biology (Core Competencies)

A. Core Competencies (numbers 1-12)	B: Required Courses or advising requirements
1. Life processes in living systems including organization of matter and energy.	BSCI 10120 Biological Foundations
2. Similarities and differences among animals, plants, fungi, microorganisms, and viruses	BSCI 10110 Biological Diversity
3. Principles and practices of biological classification	BSCI 10110 Biological Diversity
4. Theory and principles of biological evolution	BSCI 10110 Biological Diversity
5. Ecological systems including the interrelationships and dependencies of organisms with each other and their environments.	BSCI 10110 Biological Diversity BSCI 10120 Biological Foundations
6. Population dynamics and the impact of population on its environment.	BSCI 10110 Biological Diversity
7. General concepts of genetics and heredity	BSCI 30156 Elements of Genetics
8. Organizations and functions of cells and multi-cellular systems.	BSCI 10120 Biological Foundations BSCI 20140 Cell Biology
9. Behavior of organisms and their relationships to social systems.	BSCI 10110 Biological Diversity
10. Regulation of biological systems including homeostatic mechanisms	BSCI 10120 Biological Foundations
11. Fundamental processes of modeling and investigating in the biological sciences	BSCI 10110 Biological Diversity (lab component) BSCI 10120 Biological Foundations (lab component)
12. Applications of biology in environmental quality and in personal and community health	GEOG 41073 Conservation of Natural Resources

Table III: Biology Supporting Competencies

C. Supporting Competencies	B: Required Courses or advising requirements
13. General Chemistry	CHEM 10060 General Chemistry I CHEM 10061 General Chemistry II
14. Biochemistry	CHEM 30284 Introduction to Biochemistry CHEM 20481 Basic Organic Chemistry I
15. Basic chemistry laboratory techniques	CHEM 10062 General Chemistry Lab I CHEM 10063 General Chemistry Lab II
Physics	
16. Light	PHY 13002 General College Physics II
17. Sound	PHY 13001 General College Physics I
18. Optics	PHY 13002 General College Physics II
19. Electricity	PHY 13002 General College Physics II
20. Energy and order	PHY 13001 General College Physics I
21. Magnetism	PHY 13002 General College Physics II
22. Thermodynamics	PHY 13001 General College Physics I
Earth and space sciences	
23. Energy and geochemical cycles	GEOL 11040 Earth Dynamics GEOG 31062 Meteorology
24. Climate	GEOL 11040 Earth Dynamics GEOL 11042 Earth History GEOG 31062 Meteorology
25. Oceans	GEOL 11042 Earth History
26. Weather	GEOG 31062 Meteorology
27. Natural resources	GEOG 41073 Conservation of Natural Resources GEOL 11040 Earth Dynamics
28. Changes in the Earth	GEOL 11042 Earth History GEOL 11043 Earth History Lab
Mathematics	MATH 11010 Algebra for Calculus MATH 11022 Trigonometry MATH 12002 Analytic Geometry & Calculus I
29. Probability	MATH 10041 Elementary Probability and Statistics OR MATH 30011 Basic Probability and Statistics
30. Statistics	MATH 10041 Elementary Probability and Statistics OR MATH 30011 Basic Probability and Statistics

Science Content Requirement Analysis Tables I, II, III for Chemistry
Table I: Chemistry

A. Core Competencies (numbers 1-13)	B: Required Courses or advising requirements
1. Fundamental structures of atoms and molecules	CHEM 10060 General Chemistry I CHEM 10062 General Chemistry Lab I
2. Basic principles of ionic, covalent, and metallic bonding	CHEM 10060 General Chemistry I CHEM 10062 General Chemistry Lab I
3. Physical and chemical properties and classification of elements including periodicity	CHEM 10060 General Chemistry I CHEM 10062 General Chemistry Lab I
4. Chemical kinetics and thermodynamics	CHEM 10061 General Chemistry II CHEM 10063 General Chemistry Lab II
5. Principles of electrochemistry	CHEM 10061 General Chemistry II CHEM 10063 General Chemistry Lab II
6. Mole concept, stoichiometry, and laws of composition	CHEM 10060 General Chemistry I CHEM 10062 General Chemistry Lab I
7. Transition elements and coordination compounds	CHEM 30301 Inorganic Chemistry I
8. Acids and bases, oxidation-reduction chemistry, and solutions	CHEM 10061 General Chemistry II CHEM 10063 General Chemistry Lab II
9. Fundamental biochemistry	CHEM 30284 Introduction to Biological Chemistry CHEM 20481 Basic Organic Chemistry I
10. Functional and polyfunctional group chemistry	CHEM 20481 Basic Organic Chemistry I CHEM 10061 General Chemistry II
11. Environmental and atmospheric chemistry	
12. Fundamental processes of investigating in chemistry	CHEM 10062 General Chemistry Lab I CHEM 10063 General Chemistry Lab II
13. Applications of chemistry in personal and community health and environmental quality	ADED 42277 Topics in Secondary School Science

Table II: Chemistry (Advanced Competencies)

KSU SECONDARY SCIENCE LICENSES WHICH MATCH THIS COMPETENCY REQUIREMENT:
1=INTEGRATED SCIENCE-CHEMISTRY EMPHASIS
6=LIFE SCIENCE/CHEMISTRY
8=PHYSICAL SCIENCE (PHYSICS/CHEMISTRY)

B. Advanced Competencies (numbers 14-27)	B: Required Courses or advising requirements
14. Molecular orbital theory, aromaticity, metallic and ionic structures, and correlation to properties of matter	CHEM 10060 General Chemistry I CHEM 20481 Basic Organic Chemistry I CHEM 30301 Inorganic Chemistry I
15. Superconductors and principles of metallurgy	CHEM 10061 General Chemistry II (superconductors)
16. Advanced concepts of chemical kinetics, and thermodynamics	CHEM 40567 Basic Concepts of Physical Chemistry
17. Lewis adducts and coordination compounds	CHEM 10061 General Chemistry II CHEM 30301 Inorganic Chemistry I
18. Solutions, colloids, and colligative properties	CHEM 10061 General Chemistry II CHEM 30301 Inorganic Chemistry I
19. Major biological compounds and natural products	CHEM 30284 Introduction to Biological Chemistry
20. Solvent system concepts including non-aqueous solvents	CHEM 30301 Inorganic Chemistry I CHEM 30105 Analytical Chemistry I CHEM 20481 Basic Organic Chemistry I
21. Chemical reactivity and molecular structure including electronic and steric effects	CHEM 20481 Basic Organic Chemistry I CHEM 30284 Introduction to Biochemistry
22. Organic synthesis and organic reaction mechanisms	CHEM 20481 Basic Organic Chemistry I CHEM 30475 Organic Chemistry Lab
23. Energy flow through chemical systems	CHEM 30284 Introduction to Biological Chemistry
24. Issues related to chemistry including ground water pollution, disposal of plastics, and development of alternative fuels.	ADED 32277 Teaching Science in Secondary Schools
25. Historical development and perspectives in chemistry including contributions of significant figures and underrepresented groups, and the evolution of theories in chemistry	ADED 32277 Teaching Science in Secondary Schools
26. How to design, conduct, and report research in chemistry	CHEM 10062 General Chemistry Lab I CHEM 10063 General Chemistry Lab II CHEM 30475 Organic Chemistry Lab
27. Applications of chemistry and chemical technology in society, business, industry, and health fields	CHEM 40567 Basic Concepts of Physical Chemistry ADED 42277 Topics in Secondary School Science

Table III: Chemistry (Supporting Competencies)

C. Supporting Competencies (numbers 28-44)	B: Required Courses or advising requirements
1. Biology	BSCI 10120 Biological Foundations BSCI 10110 Biological Diversity
2. Molecular biology	BSCI 10120 Biological Foundations BSCI 30156 Elements of Genetics
3. Bioenergetics	BSCI 10120 Biological Foundations
4. Ecology	BSCI 10110 Biological Diversity
Earth science	
5. Geochemistry	
6. Cycles of matter	GEOL 11040 Earth Dynamics GEOG 31062 Meteorology
7. Energetics of Earth systems	GEOL 11040 Earth Dynamics
Physics	
8. Energy	PHY 13001 General College Physics I
9. Stellar evolution	PHY 24001 Astronomy or PHY 21430 Frontiers in Astronomy
10. Properties and function of waves	PHY 13002 General College Physics II
11. Properties and function of motions	PHY 13001 General College Physics I
12. Properties and function of forces	PHY 13001 General College Physics I
13. Electricity	PHY 13002 General College Physics II
14. Magnetism	PHY 13002 General College Physics II
Mathematical and statistical concepts	MATH 11010 Algebra for Calculus MATH 11022 Trigonometry MATH 12002 Analytic Geometry & Calculus I
15. Statistics	MATH 10041 Elementary Probability and Statistics OR MATH 30011 Basic Probability and Statistics
16. Use of differential equations	MATH 12002 Analytic Geometry & Calculus I **(basic)**
17. Calculus	MATH 12002 Analytic Geometry & Calculus I

Science Content Requirement Analysis Tables I, II, III for the Earth/Space Sciences

Table I: Earth/Space science (Core Competencies)

A. Core Competencies (numbers 1-12)	B: Required Courses or advising requirements
1. Characteristics of land, atmosphere, and ocean systems on Earth	GEOL 11040 Earth Dynamics
2. Properties, measurement, and classification of Earth materials	GEOL 11041 Earth Dynamics Lab
3. Changes in the Earth including land formation and erosion	GEOL 11042 Earth History
4. Geochemical cycles including biotic and abiotic systems	GEOL 11040 Earth Dynamics GEOL 11042 Earth History
5. Energy flow and transformation in Earth systems	GEOL 11040 Earth Dynamics
6. Hydrological features of the Earth	GEOL 11040 Earth Dynamics GEOL 11041 Earth Dynamics Lab
7. Patterns and changes in the atmosphere, weather, and climate	GEOG 31062 Meteorology
8. Origin, evolution, and planetary behaviors of Earth	GEOL 11042 Earth History
9. Origin, evolution, and properties of the universe	GEOL 11042 Earth History PHY 24001 Astronomy OR PHY 21430 Frontiers in Astronomy
10. Fundamental processes of investigating in the Earth and space sciences	GEOL 11041 Earth Dynamics Lab GEOL 11043 Earth History Lab
11. Sources and limits of natural resources	GEOG 41073 Conservation of Natural Resources
12. Applications of Earth and space sciences to environmental quality and to personal and community health and welfare.	GEOG 31062 Meteorology

Table III: Earth/Space Science

C. Supporting Competencies (numbers 23-43)	B: Required Courses and advised requirements
Biology	
13. Evolution	BSCI 10110 Biological Diversity
14. Ecology	BSCI 10110 Biological Diversity
15. Population dynamics	BSCI 10110 Biological Diversity
16. Flow of energy	BSCI 10120 Biological Foundations
17. Flow of material through earth systems	BSCI 10120 Biological Foundations BSCI 10110 Biological Diversity
Chemistry	
18. Broad concepts of inorganic chemistry	CHEM 10060 General Chemistry I CHEM 10061 General Chemistry II
19. Basic laboratory techniques of inorganic chemistry	CHEM 10062 General Chemistry Lab I CHEM 10063 General Chemistry Lab II
20. Broad concepts of organic chemistry	CHEM 10061 General Chemistry II CHEM 20481 Basic Organic Chemistry I
21. Basic laboratory techniques of organic chemistry	CHEM 30475 Organic Chemistry Lab
22. Physical chemistry	CHEM 10060 General Chemistry I CHEM 10061 General Chemistry II
23. Biochemistry	CHEM 20481 Basic Organic Chemistry (very basic biochem)
Physics	
24. Electricity	PHY 13002 General College Physics II
25. Forces and motion	PHY 13001 General College Physics I
26. Energy	PHY 13001 General College Physics I
27. Magnetism	PHY 13002 General College Physics II
28. Thermodynamics	PHY 13001 General College Physics I
29. Optics	PHY 13002 General College Physics II
30. Sound	PHY 13001 General College Physics I
31. Basic quantum theory	PHY 13002 General College Physics II
Mathematics	MATH 11010 Algebra for Calculus MATH 11022 Trigonometry MATH 12002 Analytic Geometry & Calculus I
32. Statistics	MATH 10041 Elementary Probability and Statistics OR MATH 30011 Basic Probability and Statistics
33. Probability	MATH 10041 Elementary Probability and Statistics OR MATH 30011 Basic Probability and Statistics

Science Content Requirement Analysis Tables I, II, and III for Physics

Table I: Physics (Core Competencies)

A. Core Competencies (numbers 1-11)	B: Required Courses and advised requirements
1. Energy, work, and power	PHY 13001 General College Physics I
2. Motion, major forces, and momentum	PHY 13001 General College Physics I
3. Newtonian physics w/engineering applications	PHY 13001 General College Physics I
4. Conservation mass, momentum, energy, and charge	PHY 13001 General College Physics I PHY 13002 General College Physics II
5. Physical properties of matter	CHEM 10060 General Chemistry I CHEM 10062 General Chemistry Lab I
6. Kinetic-molecular motion and atomic models	PHY 13001 General College Physics I PHY 13002 General College Physics II
7. Radioactivity, nuclear reactors, fission, and fusion	PHY 13002 General College Physics II CHEM 10061 General Chemistry II
8. Wave theory, sound, light, the electromagnetic spectrum and optics	PHY 13001 General College Physics I PHY 13002 General College Physics II
9. Electricity and magnetism	PHY 13002 General College Physics II
10. Fundamental processes of investigating in physics	PHY 13001 General College Physics I PHY 13002 General College Physics II
11. Applications of physics in environmental quality and to personal and community health	ADED 32277 Teaching Science in Secondary Schools

Table III: Physics (Supporting Competencies)

C. Supporting Competencies (numbers 23-38)	B: Required Courses and advising requirements
12. Biology, including organization of life, bioenergetics, biomechanics, and cycles of matter	BSCI 10120 Biological Foundations BSCI 10110 Biological Diversity
13. Organization of life	BSCI 10120 Biological Foundations
14. Bioenergetics	BSCI 10120 Biological Foundations
15. Biomechanics	BSCI 10120 Biological Foundations
16. Cycles of matter	BSCI 10120 Biological Foundations BSCI 10110 Biological Diversity
17. Chemistry	
18. Organization of matter and energy	CHEM 10060 General Chemistry I
19. Electrochemistry	CHEM 10061 General Chemistry II
20. Thermodynamics	CHEM 10061 General Chemistry II
21. Bonding	CHEM 10060 General Chemistry I
Earth sciences and/or astronomy	
22. Structures of the universe	PHY 24001 Astronomy OR PHY 21430 Frontiers in Astronomy
23. Energy	GEOG 31062 Meteorology
24. Interactions of matter	GEOL 11040 Earth Dynamics
Mathematical and statistical concepts and skills	MATH 11010 Algebra for Calculus MATH 11022 Trigonometry
25. Statistics	MATH 10041 Elementary Probability and Statistics OR MATH 30011 Basic Probability and Statistics
26. Use of differential equations	MATH 12002 Analytic Geometry & Calculus I **(basic)**
27. Calculus	MATH 12002 Analytic Geometry & Calculus I

Integrated Science – Physics Emphasis NCATE Competencies & Courses that Meet Them

Competency Requirements for All Science Teachers*

A: Competency (numbers 1-5)	B: Required Courses or advising requirements
1. Multiple ways we organize our perceptions of the world and how systems organize the studies and knowledge of science.	ADED 32277 Teaching Science in Secondary Schools
2. Nature of scientific evidence and the use of models for explanation.	ADED 32277 Teaching Science in Secondary Schools
3. Measurement as a way of knowing and organizing observations of constancy and change.	GEOL 11043 Earth History Lab CHEM 10063 Chemistry Lab II ADED 42277 Topics in Secondary School Science
4. Evolution of natural systems and factors that result in evolution or equilibrium.	GEOL 11042 Earth History [CHEM 10061 General Chemistry II BSCI 10110 Biological Diversity
5. Interrelationships of form, function, and behaviors in living and nonliving systems.	GEOL 11040 Earth Dynamics BSCI 10110 Biological Diversity PHY 24001 Astronomy or PHY 21430 Frontiers in Astronomy

Science Content Requirement Analysis Tables I, II, III for Biology

Table I: Biology (Core Competencies)

A. Core Competencies (numbers 1-12)	B: Required Courses or advising requirements
1. Life processes in living systems including organization of matter and energy.	BSCI 10120 Biological Foundations
2. Similarities and differences among animals, plants, fungi, microorganisms, and viruses	BSCI 10110 Biological Diversity
3. Principles and practices of biological classification	BSCI 10110 Biological Diversity
4. Theory and principles of biological evolution	BSCI 10110 Biological Diversity
5. Ecological systems including the interrelationships and dependencies of organisms with each other and their environments.	BSCI 10110 Biological Diversity BSCI 10120 Biological Foundations
6. Population dynamics and the impact of population on its environment.	BSCI 10110 Biological Diversity
7. General concepts of genetics and heredity	BSCI 30156 Elements of Genetics
8. Organizations and functions of cells and multi-cellular systems.	BSCI 10120 Biological Foundations BSCI 20140 Cell Biology
9. Behavior of organisms and their relationships to social systems.	BSCI 10110 Biological Diversity
10. Regulation of biological systems including homeostatic mechanisms	BSCI 10120 Biological Foundations
11. Fundamental processes of modeling and investigating in the biological sciences	BSCI 10110 Biological Diversity (lab component) BSCI 10120 Biological Foundations (lab component)
12. Applications of biology in environmental quality and in personal and community health	GEOG 41073 Conservation of Natural Resources

Table III: Biology Supporting Competencies

C. Supporting Competencies	B: Required Courses or advising requirements
13. General Chemistry	CHEM 10060 General Chemistry I CHEM 10061 General Chemistry II
14. Biochemistry	CHEM 30284 Introduction to Biochemistry CHEM 20481 Basic Organic Chemistry I
15. Basic chemistry laboratory techniques	CHEM 10062 General Chemistry Lab I CHEM 10063 General Chemistry Lab II
Physics	
16. Light	PHY 23002 General Physics II
17. Sound	PHY 23001 General Physics I
18. Optics	PHY 23002 General Physics II
19. Electricity	PHY 23002 General Physics II
20. Energy and order	PHY 23001 General Physics I
21. Magnetism	PHY 23002 General Physics II
22. Thermodynamics	PHY 23001 General Physics I
Earth and space sciences	
23. Energy and geochemical cycles	GEOL 11040 Earth Dynamics GEOG 31062 Meteorology
24. Climate	GEOL 11040 Earth Dynamics GEOL 11042 Earth History GEOG 31062 Meteorology
25. Oceans	GEOL 11042 Earth History
26. Weather	GEOG 31062 Meteorology
27. Natural resources	GEOG 41073 Conservation of Natural Resources GEOL 11040 Earth Dynamics
28. Changes in the Earth	GEOL 11042 Earth History GEOL 11043 Earth History Lab
Mathematics	MATH 11010 Algebra for Calculus MATH 11022 Trigonometry MATH 12002 Analytic Geometry & Calculus I
29. Probability	MATH 10041 Elementary Probability and Statistics OR MATH 30011 Basic Probability and Statistics
30. Statistics	MATH 10041 Elementary Probability and Statistics OR MATH 30011 Basic Probability and Statistics

Science Content Requirement Analysis Tables I, II, III for Chemistry
Table I: Chemistry

A. Core Competencies (numbers 1-13)	B: Required Courses or advising requirements
1. Fundamental structures of atoms and molecules	CHEM 10060 General Chemistry I CHEM 10062 General Chemistry Lab I
2. Basic principles of ionic, covalent, and metallic bonding	CHEM 10060 General Chemistry I CHEM 10062 General Chemistry Lab I
3. Physical and chemical properties and classification of elements including periodicity	CHEM 10060 General Chemistry I CHEM 10062 General Chemistry Lab I
4. Chemical kinetics and thermodynamics	CHEM 10061 General Chemistry II CHEM 10063 General Chemistry Lab II
5. Principles of electrochemistry	CHEM 10061 General Chemistry II CHEM 10063 General Chemistry Lab II
6. Mole concept, stoichiometry, and laws of composition	CHEM 10060 General Chemistry I CHEM 10062 General Chemistry Lab I
7. Transition elements and coordination compounds	
8. Acids and bases, oxidation-reduction chemistry, and solutions	CHEM 10061 General Chemistry II CHEM 10063 General Chemistry Lab II
9. Fundamental biochemistry	CHEM 30284 Introduction to Biological Chemistry CHEM 20481 Basic Organic Chemistry I
10. Functional and polyfunctional group chemistry	CHEM 20481 Basic Organic Chemistry I CHEM 10061 General Chemistry II
11. Environmental and atmospheric chemistry	
12. Fundamental processes of investigating in chemistry	CHEM 10062 General Chemistry Lab I CHEM 10063 General Chemistry Lab II
13. Applications of chemistry in personal and community health and environmental quality	ADED 42277 Topics in Secondary School Science

Table III: Chemistry (Supporting Competencies)

C. Supporting Competencies (numbers 28-44)	B: Required Courses or advising requirements
1. Biology	BSCI 10120 Biological Foundations BSCI 10110 Biological Diversity
2. Molecular biology	BSCI 10120 Biological Foundations BSCI 30156 Elements of Genetics
3. Bioenergetics	BSCI 10120 Biological Foundations
4. Ecology	BSCI 10110 Biological Diversity
Earth science	
5. Geochemistry	
6. Cycles of matter	GEOL 11040 Earth Dynamics GEOG 31062 Meteorology
7. Energetics of Earth systems	GEOL 11040 Earth Dynamics
Physics	
8. Energy	PHY 23001 General Physics I
9. Stellar evolution	PHY 24001 Astronomy or PHY 21430 Frontiers in Astronomy
10. Properties and function of waves	PHY 23002 General Physics II
11. Properties and function of motions	PHY 23001 General Physics I
12. Properties and function of forces	PHY 23001 General Physics I
13. Electricity	PHY 23002 General Physics II
14. Magnetism	PHY 23002 General Physics II
Mathematical and statistical concepts	MATH 11010 Algebra for Calculus MATH 11022 Trigonometry MATH 12002 Analytic Geometry & Calculus I
15. Statistics	MATH 10041 Elementary Probability and Statistics OR MATH 30011 Basic Probability and Statistics
16. Use of differential equations	MATH 12002 Analytic Geometry & Calculus I **(basic)** MATH 12003 Calculus II **(basic)**
17. Calculus	MATH 12002 Analytic Geometry & Calculus I

Science Content Requirement Analysis Tables I, II, III for the Earth/Space Sciences

Table I: Earth/Space science (Core Competencies)

A. Core Competencies (numbers 1-12)	B: Required Courses or advising requirements
1. Characteristics of land, atmosphere, and ocean systems on Earth	GEOL 11040 Earth Dynamics
2. Properties, measurement, and classification of Earth materials	GEOL 11041 Earth Dynamics Lab
3. Changes in the Earth including land formation and erosion	GEOL 11042 Earth History
4. Geochemical cycles including biotic and abiotic systems	GEOL 11040 Earth Dynamics GEOL 11042 Earth History
5. Energy flow and transformation in Earth systems	GEOL 11040 Earth Dynamics
6. Hydrological features of the Earth	GEOL 11040 Earth Dynamics GEOL 11041 Earth Dynamics Lab
7. Patterns and changes in the atmosphere, weather, and climate	GEOG 31062 Meteorology
8. Origin, evolution, and planetary behaviors of Earth	GEOL 11042 Earth History
9. Origin, evolution, and properties of the universe	GEOL 11042 Earth History PHY 24001 Astronomy OR PHY 21430 Frontiers in Astronomy
10. Fundamental processes of investigating in the Earth and space sciences	GEOL 11041 Earth Dynamics Lab GEOL 11043 Earth History Lab
11. Sources and limits of natural resources	GEOG 41073 Conservation of Natural Resources
12. Applications of Earth and space sciences to environmental quality and to personal and community health and welfare.	GEOG 31062 Meteorology

Table III: Earth/Space Science

C. Supporting Competencies (numbers 23-43)	B: Required Courses and advised requirements
Biology	
13. Evolution	BSCI 10110 Biological Diversity
14. Ecology	BSCI 10110 Biological Diversity
15. Population dynamics	BSCI 10110 Biological Diversity
16. Flow of energy	BSCI 10120 Biological Foundations
17. Flow of material through earth systems	BSCI 10120 Biological Foundations BSCI 10110 Biological Diversity
Chemistry	
18. Broad concepts of inorganic chemistry	CHEM 10060 General Chemistry I CHEM 10061 General Chemistry II
19. Basic laboratory techniques of inorganic chemistry	CHEM 10062 General Chemistry Lab I CHEM 10063 General Chemistry Lab II
20. Broad concepts of organic chemistry	CHEM 10061 General Chemistry II CHEM 20481 Basic Organic Chemistry I
21. Basic laboratory techniques of organic chemistry	
22. Physical chemistry	CHEM 10060 General Chemistry I CHEM 10061 General Chemistry II
23. Biochemistry	CHEM 20481 Basic Organic Chemistry (very basic biochem)
Physics	
24. Electricity	PHY 23002 General Physics II
25. Forces and motion	PHY 23001 General Physics I
26. Energy	PHY 23001 General Physics I
27. Magnetism	PHY 23002 General Physics II
28. Thermodynamics	PHY 23001 General Physics I
29. Optics	PHY 23002 General Physics II
30. Sound	PHY 23001 General Physics I
31. Basic quantum theory	PHY 23002 General Physics II
Mathematics	MATH 11010 Algebra for Calculus MATH 11022 Trigonometry MATH 12002 Analytic Geometry & Calculus I MATH 12003 Calculus II
32. Statistics	MATH 10041 Elementary Probability and Statistics OR MATH 30011 Basic Probability and Statistics
33. Probability	MATH 10041 Elementary Probability and Statistics OR MATH 30011 Basic Probability and Statistics

Science Content Requirement Analysis Tables I, II, and III for Physics

Table I: Physics (Core Competencies)

A. Core Competencies (numbers 1-11)	B: Required Courses and advised requirements
1. Energy, work, and power	PHY 23001 General Physics I
2. Motion, major forces, and momentum	PHY 23001 General Physics I
3. Newtonian physics w/engineering applications	PHY 23001 General Physics I
4. Conservation mass, momentum, energy, and charge	PHY 23001 General Physics I PHY 23002 General Physics II
5. Physical properties of matter	CHEM 10060 General Chemistry I CHEM 10062 General Chemistry Lab I
6. Kinetic-molecular motion and atomic models	PHY 23001 General Physics I PHY 23002 General Physics II
7. Radioactivity, nuclear reactors, fission, and fusion	PHY 23002 General Physics II CHEM 10061 General Chemistry II
8. Wave theory, sound, light, the electromagnetic spectrum and optics	PHY 23001 General Physics I PHY 23002 General Physics II
9. Electricity and magnetism	PHY 23002 General Physics II
10. Fundamental processes of investigating in physics	PHY 23001 General Physics I PHY 23002 General Physics II
11. Applications of physics in environmental quality and to personal and community health	ADED 42277 Teaching Science in Secondary Schools

Table II: Physics (Advanced Competencies)

KSU SECONDARY SCIENCE LICENSES WHICH MATCH THIS COMPETENCY REQUIREMENT:

4=INTEGRATED SCIENCE-PHYSICS EMPHASIS
8=PHYSICAL SCIENCE (PHYSICS/CHEMISTRY)

B. Advanced Competencies (numbers 12-22)	B: Required Courses and advising requirements
12. Thermodynamics and energy-matter relationships	PHY 24001 Astronomy PHY 36001 Introductory Modern Physics
13. Nuclear physics including matter-energy duality and reactivity	PHY 36001 Introductory Modern Physics CHEM 10061 General Chemistry II
14. Angular rotation and momentum, centripetal forces, and vector analysis	PHY 23001 General Physics I
15. Quantum mechanics, space-time relationships, and special relativity	PHY 36001 Introductory Modern Physics
16. Models of nuclear and subatomic structures and behavior	PHY 36001 Introductory Modern Physics CHEM 10060 General Chemistry I CHEM 10061 General Chemistry II
17. Light behavior, including wave-particle duality and models	PHY 23003 General Physics II PHY 36001 Introductory Modern Physics
18. Electrical phenomena including electric fields, vector analysis, energy, potential, capacitance, and inductance	PHY 23003 General Physics II PHY 32511 Electronics
19. Issues related to physics such as disposal of nuclear waste, light pollution, shielding communication systems and weapons development	ADED 32277 Teaching Science in the Secondary Schools
20. Historical development and cosmological perspectives in physics including contributions of significant figures and underrepresented groups, and evolution of theories in physics	ADED 32277 Teaching Science in the Secondary Schools
21. How to design, conduct, and report research in physics	PHY 30020 Intermediate Physics Lab PHY 32511 Electronics
22. Applications of physics and engineering in society, business, industry, and health fields	PHY 32511 Electronics ADED 42277 Topics in Secondary School Science

Table III: Physics (Supporting Competencies)

C. Supporting Competencies (numbers 23-38)	B: Required Courses and advising requirements
23. Biology, including organization of life, bioenergetics, biomechanics, and cycles of matter	BSCI 10120 Biological Foundations **[1, 2, 3, 4, 8]** BSCI 10110 Biological Diversity **[1, 2, 3, 4]**
24. Organization of life	BSCI 10120 Biological Foundations **[1, 2, 3, 4, 8]**
25. Bioenergetics	BSCI 10120 Biological Foundations **[1, 2, 3, 4, 8]**
26. Biomechanics	BSCI 10120 Biological Foundations **[1, 2, 3, 4, 8]**
27. Cycles of matter	BSCI 10120 Biological Foundations **[1, 2, 3, 4, 8]** BSCI 10110 Biological Diversity **[1, 2, 3, 4]**
28. Chemistry	
29. Organization of matter and energy	CHEM 10060 General Chemistry I **[1, 2, 3, 4, 8]**
30. Electrochemistry	CHEM 10061 General Chemistry II **[1, 2, 3, 4, 8]**
31. Thermodynamics	CHEM 10061 General Chemistry II **[1, 2, 3, 4, 8]**
32. Bonding	CHEM 10060 General Chemistry I **[1, 2, 3, 4, 8]**
Earth sciences and/or astronomy	
33. Structures of the universe	PHY 24001 Astronomy OR PHY 21430 Frontiers in Astronomy **[1, 2, 3, 4, 8]**
34. Energy	GEOG 31062 Meteorology **[1, 2, 3, 4, 8]** GEOL 41025 Geophysics **[4, 8]**
35. Interactions of matter	GEOL 11040 Earth Dynamics **[1, 2, 3, 4]** GEOL 41025 Geophysics **[4, 8]**
Mathematical and statistical concepts and skills	MATH 11010 Algebra for Calculus **[1, 2, 3, 4, 8]** MATH 11022 Trigonometry **[1, 2, 3, 4, 8]**
36. Statistics	MATH 10041 Elementary Probability and Statistics OR MATH 30011 Basic Probability and Statistics **[1, 2, 3, 4]**
37. Use of differential equations	MATH 12002 Analytic Geometry & Calculus I **[1, 2, 3, 4, 6, 8] (basic)** MATH 12003 Calculus II **[4, 8] (basic)**
38. Calculus	MATH 12002 Analytic Geometry & Calculus I **[1, 2, 3, 4, 8]** MATH 12003 Calculus II **[4, 8]**

Physical Science NCATE Competencies and the Courses that Meet Them

Competency Requirements for All Science Teachers*

A: Competency (numbers 1-5)	B: Required Courses or advising requirements
1. Multiple ways we organize our perceptions of the world and how systems organize the studies and knowledge of science.	ADED 32277 Teaching Science in Secondary Schools
2. Nature of scientific evidence and the use of models for explanation.	ADED 32277 Teaching Science in Secondary Schools
3. Measurement as a way of knowing and organizing observations of constancy and change.	CHEM 10063 Chemistry Lab II ADED 42277 Topics in Secondary School Science
4. Evolution of natural systems and factors that result in evolution or equilibrium.	CHEM 10061 General Chemistry II BSCI 10110 Biological Diversity
5. Interrelationships of form, function, and behaviors in living and nonliving systems.	PHY 24001 Astronomy or PHY 21430 Frontiers in Astronomy

Science Content Requirement Analysis Tables I, II, III for Chemistry
Table I: Chemistry

A. Core Competencies (numbers 1-13)	B: Required Courses or advising requirements
1. Fundamental structures of atoms and molecules	CHEM 10060 General Chemistry I CHEM 10062 General Chemistry Lab I
2. Basic principles of ionic, covalent, and metallic bonding	CHEM 10060 General Chemistry I CHEM 10062 General Chemistry Lab I
3. Physical and chemical properties and classification of elements including periodicity	CHEM 10060 General Chemistry I CHEM 10062 General Chemistry Lab I
4. Chemical kinetics and thermodynamics	CHEM 10061 General Chemistry II CHEM 10063 General Chemistry Lab II
5. Principles of electrochemistry	CHEM 10061 General Chemistry II CHEM 10063 General Chemistry Lab II
6. Mole concept, stoichiometry, and laws of composition	CHEM 10060 General Chemistry I CHEM 10062 General Chemistry Lab I
7. Transition elements and coordination compounds	CHEM 30301 Inorganic Chemistry
8. Acids and bases, oxidation-reduction chemistry, and solutions	CHEM 10061 General Chemistry II CHEM 10063 General Chemistry Lab II
9. Fundamental biochemistry	CHEM 30284 Introduction to Biological Chemistry CHEM 20481 Basic Organic Chemistry I
10. Functional and polyfunctional group chemistry	CHEM 20481 Basic Organic Chemistry I CHEM 10061 General Chemistry II
11. Environmental and atmospheric chemistry	
12. Fundamental processes of investigating in chemistry	CHEM 10062 General Chemistry Lab I CHEM 10063 General Chemistry Lab II
13. Applications of chemistry in personal and community health and environmental quality	ADED 42277 Topics in Secondary School Sciences

Table II: Chemistry (Advanced Competencies)

B. Advanced Competencies (numbers 14-27)	B: Required Courses or advising requirements
14. Molecular orbital theory, aromaticity, metallic and ionic structures, and correlation to properties of matter	CHEM 10060 General Chemistry I CHEM 20481 Basic Organic Chemistry I CHEM 30301 Inorganic Chemistry I
15. Superconductors and principles of metallurgy	CHEM 10061 General Chemistry II (superconductors)
16. Advanced concepts of chemical kinetics, and thermodynamics	CHEM 40567 Basic Concepts of Physical Chemistry
17. Lewis adducts and coordination compounds	CHEM 10061 General Chemistry II CHEM 30301 Inorganic Chemistry I
18. Solutions, colloids, and colligative properties	CHEM 10061 General Chemistry II CHEM 30301 Inorganic Chemistry
19. Major biological compounds and natural products	CHEM 30284 Introduction to Biological Chemistry
20. Solvent system concepts including non-aqueous solvents	CHEM 30301 Inorganic Chemistry I CHEM 30105 Analytical Chemistry I CHEM 20481 Basic Organic Chemistry I
21. Chemical reactivity and molecular structure including electronic and steric effects	CHEM 20481 Basic Organic Chemistry I CHEM 30284 Introduction to Biochemistry
22. Organic synthesis and organic reaction mechanisms	CHEM 20481 Basic Organic Chemistry I
23. Energy flow through chemical systems	CHEM 30284 Introduction to Biological Chemistry
24. Issues related to chemistry including ground water pollution, disposal of plastics, and development of alternative fuels.	ADED 32277 Teaching Science in Secondary Schools
25. Historical development and perspectives in chemistry including contributions of significant figures and underrepresented groups, and the evolution of theories in chemistry	ADED 32277 Teaching Science in Secondary Schools
26. How to design, conduct, and report research in chemistry	CHEM 10062 General Chemistry Lab I CHEM 10063 General Chemistry Lab II
27. Applications of chemistry and chemical technology in society, business, industry, and health fields	CHEM 40567 Basic Concepts of Physical Chemistry ADED 42277 Topics in Secondary School Science

Table III: Chemistry (Supporting Competencies)

C. Supporting Competencies (numbers 28-44)	B: Required Courses or advising requirements
1. Biology	BSCI 10120 Biological Foundations
2. Molecular biology	BSCI 10120 Biological Foundations
3. Bioenergetics	BSCI 10120 Biological Foundations
4. Ecology	
Earth science	
5. Geochemistry	
6. Cycles of matter	GEOG 31062 Meteorology
7. Energetics of Earth systems	
Physics	
8. Energy	PHY 23001 General Physics I
9. Stellar evolution	PHY 24001 Astronomy or PHY 21430 Frontiers in Astronomy
10. Properties and function of waves	PHY 23002 General Physics II
11. Properties and function of motions	PHY 23001 General Physics I
12. Properties and function of forces	PHY 23001 General Physics I
13. Electricity	PHY 23002 General Physics II
14. Magnetism	PHY 23002 General Physics II
Mathematical and statistical concepts	MATH 11010 Algebra for Calculus MATH 11022 Trigonometry MATH 12002 Analytic Geometry & Calculus I
15. Statistics	
16. Use of differential equations	MATH 12002 Analytic Geometry & Calculus I MATH 12003 Calculus II
17. Calculus	MATH 12002 Analytic Geometry & Calculus I

Science Content Requirement Analysis Tables I, II, and III for Physics

Table I: Physics (Core Competencies)

A. Core Competencies (numbers 1-11)	B: Required Courses and advised requirements
1. Energy, work, and power	PHY 23001 General Physics I
2. Motion, major forces, and momentum	PHY 23001 General Physics I
3. Newtonian physics w/engineering applications	PHY 23001 General Physics I
4. Conservation mass, momentum, energy, and charge	PHY 23001 General Physics I PHY 23002 General Physics II
5. Physical properties of matter	CHEM 10060 General Chemistry I CHEM 10062 General Chemistry Lab I
6. Kinetic-molecular motion and atomic models	PHY 23001 General Physics I PHY 23002 General Physics II
7. Radioactivity, nuclear reactors, fission, and fusion	PHY 23002 General Physics II CHEM 10061 General Chemistry II
8. Wave theory, sound, light, the electromagnetic spectrum and optics	PHY 23001 General Physics I PHY 23002 General Physics II
9. Electricity and magnetism	PHY 23002 General Physics II
10. Fundamental processes of investigating in physics	PHY 23001 General Physics I PHY 23002 General Physics II
11. Applications of physics in environmental quality and to personal and community health	ADED 32277 Teaching Science in Secondary Schools

Table II: Physics (Advanced Competencies)

B. Advanced Competencies (numbers 12-22)	B: Required Courses and advising requirements
12. Thermodynamics and energy-matter relationships	PHY 24001 Astronomy PHY 36001 Introductory Modern Physics
13. Nuclear physics including matter-energy duality and reactivity	PHY 36001 Introductory Modern Physics CHEM 10061 General Chemistry II
14. Angular rotation and momentum, centripetal forces, and vector analysis	PHY 23001 General Physics I
15. Quantum mechanics, space-time relationships, and special relativity	PHY 36001 Introductory Modern Physics
16. Models of nuclear and subatomic structures and behavior	PHY 36001 Introductory Modern Physics CHEM 10060 General Chemistry I CHEM 10061 General Chemistry II
17. Light behavior, including wave-particle duality and models	PHY 23003 General Physics II PHY 36001 Introductory Modern Physics
18. Electrical phenomena including electric fields, vector analysis, energy, potential, capacitance, and inductance	PHY 23003 General Physics II PHY 32511 Electronics
19. Issues related to physics such as disposal of nuclear waste, light pollution, shielding communication systems and weapons development	ADED 32277 Teaching Science in the Secondary Schools
20. Historical development and cosmological perspectives in physics including contributions of significant figures and underrepresented groups, and evolution of theories in physics	ADED 32277 Teaching Science in the Secondary Schools
21. How to design, conduct, and report research in physics	PHY 30020 Intermediate Physics Lab PHY 32511 Electronics
22. Applications of physics and engineering in society, business, industry, and health fields	PHY 32511 Electronics ADED 42277 Topics in Secondary School Science