I. APPROVAL OF THE FEBRUARY 14, 2012 CAC MINUTES

II. REPORT OF THE COMMITTEE ON GRADUATE STUDIES (CGS)
Submitted by Katie Rockey; presented by Ed Morris, 2011-2012 CGS Chair

   A. Curricular Changes for Approval

      NEW COURSES: CLSX 899, EALC 764, LING 742, LING 851, & POLS 957
      CHANGES: BIOL 925, FMS 801, LING 738, & VAE 780

   B. Program Changes

      1. Classics
      2. Environmental Studies
      3. Film & Media Studies
      4. Mathematics

III. REPORT OF THE COMMITTEE ON UNDERGRADUATE STUDIES & ADVISING (CUSA)
Submitted by Lanis Atwood, Presented by Chris Fischer, 2011-2012 CUSA Chair

   A. Curricular Changes for Approval

      All Departments except Chemistry:

      NEW COURSES: HWC 490, EALC 121, ISP 490, LING 451

      CHANGES: BIOL 661, ITAL 107, ITAL 108, ITAL 110, ITAL 155, ITAL 156, ITAL 230,
                 ITAL 240, ITAL 300, ITAL 315, TD 301-TD 401, TD 302-TD 402, TD 303-TD 405, VAE 497,
                 VAE 500

      DELETIONS: BIOL 660

      Chemistry:

      NEW COURSES: CHEM 170, CHEM 175

      CHANGES: ATMO 525, BIOL 150, BIOL 151, BIOL 408, BIOL 416, BIOL 426, BIOL 594,
                 BIOL 636, BIOL 656, BIOL 662, CHEM 184-CHEM 130, CHEM 185-190, CHEM 188-CHEM
                 135, CHEM 189-CHEM 195, CHEM 516-CHEM 620, CHEM 517-CHEM 621, CHEM 622-CHEM
                 210, CHEM 624-CHEM 230, CHEM 625-CHEM 231, CHEM 626-CHEM 235, CHEM 627-CHEM
                 236, CHEM 628-CHEM 280, CHEM 630-CHEM 285, CHEM 635, CHEM 636, CHEM 640-CHEM
                 510, CHEM 641-511, CHEM 646-CHEM 530, CHEM647-CHEM 531, CHEM 648-CHEM 535,
                 CHEM 649-CHEM 536, CHEM 667-CHEM 660, CHEM 668-CHEM 661, EVRN 335, EVRN 535,
                 EVRN 538, EVRN 611, EVRN 656, GEOG 335, GEOG 535, GEOG 538, GEOL 311, GEOL 312
B. Degree Requirements for Approval:

1. Change to Existing BA in Geology-Environmental Geology option (related to BIOL 660/661 change)
2. New Non-Western Culture Designation for EALC 121
3. Change to Existing B.S. Chemistry - all options
4. Chemistry Related Changes to other Majors and Minors
   a. B.A. Major in Astronomy
   b. B.S. Degree in Astronomy
   c. B.S. Degree in Atmospheric Science
   d. B.A. Biochemistry
   e. B.S. Biochemistry Degree
   f. B.A. Biology Major
   g. B.S. Biology Degree-all emphases
   h. B.A. Human Biology Major
   i. B.A. Microbiology Major
   j. B.S. Microbiology Degree
   k. B.S. Molecular Biosciences Degree
   l. B.S. Degree Environmental Studies
   m. B.S. Degree Geography
   n. B.A. Geology Major
   o. B.S. Geology Degree-all emphases
   p. B.A. Major in Physics
   q. B.S. Degree in Physics
   r. B.S. Behavioral Neuroscience Degree
5. Proposal for a change to criteria for selecting the BGS LA&S option

Next meeting of the CAC will be Tuesday, April 10, 2012, at 4:00 PM in 210 Strong Hall

I. APPROVAL OF THE FEBRUARY 14, 2012 CAC MINUTES

College of Liberal Arts & Sciences
College Academic Council
Minutes – February 14, 2012

Committee members in attendance: Norman Akers, Jackie Brinton, Marta Caminero-Santangelo, Allard Jongman, Jorge Pérez, Robin Rowland, Terry Slocum, Kathy Suprenant


The meeting was called to order by Associate Dean Liz Kowalchuk at 4:00 PM.
Minutes
A motion was made and seconded to approve the December 13, 2011 minutes of the College Academic Council as written. The motion was approved unanimously.

Report of the Committee on Graduate Studies (CGS)
(Ed Morris, 2011-2012 CGS Chair, reporting)

- The motion (CGS report by Ed Morris) was seconded, and the CAC voted unanimously to approve the following curricular changes:
  1. **New Course:** PSYC 789
  2. **Deleted Courses:** HA 727 & HA 806
  3. **Course Changes:** ANTH 715, GEOG 805, & PSYC 898

Report of the Committee on Undergraduate Studies & Advising (CUSA)
(Chris Fischer, 2011-2012 CUSA Chair, reporting)

- The motion (CUSA report by Chris Fischer) was seconded, and the CAC voted unanimously to approve the following curricular changes:
  1. **New Courses:** HA 311, HA 390, HA 391, HA 393, HA 394, HA 395, HA 396, HA 397, HA 590, HA 591, HA 593, HA 594, HA 595, HA 596, HA 597, LING 442
  2. **Course Changes:** CHIN 204, PHSX 213
  3. **Course Deletions:** HA 535, HA 604, HA 615, HA 675, EXM 539, PRNT 579, SCUL 559

- The motion (CUSA report by Chris Fisher) was seconded, and the CAC voted unanimously to table the following curricular change:
  EALC 130

- The motion (CUSA report by Chris Fischer) was seconded, and the CAC voted unanimously to approve the following degree requirements:
  6. Change to Existing History of Art Minor
  7. Change in Existing Major for Latin American Studies
  8. Creation of Departmental Honors in Latin American Studies
  4. Change to Existing Major in Bachelor of Art Education
  5. Change to Existing Major in Anthropology

The CAC meeting was ended by consensus at 4:12 PM.

Next College Academic Council Meeting: Tuesday, March 13, 2012, at 4:00 PM (210 Strong Hall)

Minutes recorded by Maureen Cole and transcribed by Anne Sawyer (Secretary to the College Assembly)

II. REPORT OF THE COMMITTEE ON GRADUATE STUDIES (CGS)
Submitted by Katie Rockey; presented by Ed Morris, 2011-2012 CGS Chair

Curricular Changes for Approval

1. New courses: CLSX 899, EALC 764, LING 742, LING 851, & POLS 957
CLASSICS

CLS 899 Thesis (1-6) Thesis hours. THE

JUSTIFICATION
For an M.A. thesis our department currently offers, for 1-6 hours, both GRK 899 and LAT 899 for a thesis that concentrates on ancient Greek and classical Latin languages and literatures, respectively. Since our department now has two full-time archaeologist/art historians, students are writing theses on topics with an emphasis in classical archaeology/art history and we would like to add the CLSX 899 course for these cases.

EAST ASIAN LANGUAGES & CULTURES

EALC 764 Modern Korean Culture and Society (3) An examination of the history, society, values, and political economy of Korea in its East Asian and global context. The course will use a multi-disciplinary approach, including history, ethnography, fiction and film. LEC

JUSTIFICATION
Dr. Kyoim Yun, a junior faculty member, has taught this course using EALC 790: Topics in: ___ and would like to make it a regular course offering. Student interest in Korea has been growing.

LINGUISTICS

LING 742 Neurolinguistics II (3) An in-depth discussion of the representation and processing of language from a cognitive neuroscience perspective. This course involves critical discussion of selected topics of current research interest in neurolinguistics. The course also includes a significant hands-on component, in which students receive training in research on the cognitive neuroscience of language by developing and implementing a new EEG study on an aspect of language, as well by completing as a series of mini-labs introducing neuroimaging methods and analyses. Prerequisite: LING738 or permission of the instructor. SEM

JUSTIFICATION
Interest in Neurolinguistics continues to be high, and many students pursue neurolinguistic experiments as part of their graduate research. This course allows students to gain both an in-depth view of issues of current interest, and critical hands-on training in neurolinguistic research development, equipping them to incorporate neurolinguistic techniques into their research projects and their research training. Students will now be able to complete a two-course sequence in Neurolinguistics, on par with the other content areas that we offer in Linguistics (phonetics, phonology, syntax, first language acquisition, second language acquisition, and psycholinguistics).

LING 851 Research in Language Acquisition and Processing (3) This course is primarily intended for students actively engaged in linguistic research on language acquisition, language processing, and neurolinguistics. Students in this course present and discuss study design, methods, data analysis and interpretation of results for their research projects. Professional development topics such as CV development, applications for fellowships, grants and jobs, and the dissemination of research findings are also discussed. May be repeated. Prerequisite: Permission of instructor. SEM

JUSTIFICATION
This has been taught as a seminar course for three semesters under our generic 910 seminar number. Because student interest remains high and there is faculty available to teach it on a regular basis, we would like to make it a formal course with its own number. This course allows students to focus on their own research projects. We will allow students to repeat the course. The content changes every semester, with the discussion of new research projects and methods; continuing students also need different types of training and feedback as they progress through different stages of their research project development and implementation, and as they prepare to graduate and apply/interview for academic jobs/postdocs. Moreover, different "professional methods" content will be offered in different semesters, ranging from job application preparation, to interview preparation/practice,
abstract preparation, the peer-reviewed manuscript submission process, and reviewing, among many other topics.

**POLITICAL SCIENCE**

**POLS 957 Comparative Political Behavior** (3) The course introduces students to the vast literature on comparative elections and comparative political parties. It pursues a twofold goal. First, the course surveys the large comparative electoral behavior literature. The themes covered in the first half include a discussion of why voters participate in elections, how voters form preferences, how psychological processes affect mass views, and how these, in turn, influence party preferences. Second, the course introduces students to the supply-side of politics and the role of political parties. This second part of the course, therefore, examines why parties form in the first place, what motives they have, what choices they offer in short, how and why parties compete. Together, the way voters form preferences and the logic of party formation illuminate a central element of the democratic process. LEC

**JUSTIFICATION**

There is currently no course at KU that covers these topics so that students wishing to deepen their expertise in this area, so that this course offers them an opportunity to prepare their research agenda, and/or to become familiar with a vibrant field in comparative politics in order to take doctoral exams in Comparative politics.

2. Course changes: BIOL 925, FMS 801, LING 738, & VAE 780

**BIOLOGY**

**CHANGE: DESCRIPTION & PREREQUISITE**

**(OLD)**

**BIOL 925 Research Grant Proposal Preparation** (3) Formats, strategies, and styles of research grant proposal writing. Prerequisite: Completion of three semesters of the molecular biosciences or genetics program graduate curriculum, or consent of instructor. LEC

**(NEW)**

**BIOL 925 Research Grant Proposal Preparation** (3) This course introduces the basics of preparing a successful scientific grant application. Topics to be covered include how to develop a novel, fundable project, scientific writing and grantsmanship, and what criteria reviewers consider in evaluating grants. The course will be a mix of instruction and class discussion. Prerequisite: Admission to the graduate program in Molecular Biosciences, or consent of instructor. LEC

**JUSTIFICATION**

Change in timing of class: Gives students greater time to fully prepare for their oral examinations (which in our department require a grant proposal to be generated). Description: The previous description rectifies this. The new instructor (Dr. Stuart Macdonald) plans to use more discussion and "mock review panel" type classes to help students learn how best to obtain funding, and the description now suggests the class is not wholly driven by lecture-based instruction. Prerequisites: The previous prerequisites (specifically "Completion of three semesters of the molecular biosciences or genetics program graduate curriculum") will be incorrect once the class switches to Spring (students will have completed just 2 semesters before enrolling in the class). Thus we opt for a simpler prerequisite (they must be a student in our department), while still allowing for non-Molecular Biosciences students to take the class if the instructor agrees.

**FILM & MEDIA STUDIES**

**CHANGE: DESCRIPTION**
(OLD)
**FMS 801 Professional Development Seminar** (1) Preparation for faculty careers in film and related fields, including issues of research, teaching, and service. Specific topics and emphases vary from semester to semester. May be repeated for credit. SEM

(NEW)
**FMS 801 Professional Development Seminar** (1) Preparation and training for faculty careers in film and related fields, including research skills and methods, responsible scholarship, teaching, and service. Other topics vary from semester to semester. May be repeated for credit. SEM

JUSTIFICATION
The course description is being updated to reflect information on Research Skills and Responsible Scholarship to be offered each time as required by the Office of Graduate Studies.

**LINGUISTICS**

CHANGE: TITLE

(OLD)
**LING 738 Neurolinguistics** (3) We will explore how language is represented and processed in the human brain. This will include a critical survey of the foundations and the newest state-of-the-art research in the cognitive neuroscience of language, focusing on the techniques of functional brain imaging (fMRI, PET, EEG, MEG, and related methods), and research on aphasia and other language disorders. This course will also include a laboratory component providing hands-on experience with brain imaging research on language. LING 700 or equivalent course. LEC

(NEW)
**LING 738 Neurolinguistics I** (3) We will explore how language is represented and processed in the human brain. This will include a critical survey of the foundations and the newest state-of-the-art research in the cognitive neuroscience of language, focusing on the techniques of functional brain imaging (fMRI, PET, EEG, MEG, and related methods), and research on aphasia and other language disorders. This course will also include a laboratory component providing hands-on experience with brain imaging research on language. LING 700 or equivalent course. LEC

JUSTIFICATION
The purpose for the requested course title change (changing LING 738 from "Neurolinguistics" to "Neurolinguistics I") is to make the course title numbering consistent with the new Neurolinguistics II course (LING 742). The new LING 742 Neurolinguistics II course has been approved by the Committee, pending our submission of a request to change the title of LING 738 from Neurolinguistics to Neurolinguistics I.

**VISUAL ART**

CHANGE: CREDIT HOURS

(OLD)
**VAE 780 Internship in Teaching Art** (5-16) A supervised internship experience leading to initial art teacher certification. The student assumes the total professional role as a teacher of art in an approved school setting. LEC

(NEW)
**VAE 780 Internship in Teaching Art** (9) A supervised internship experience leading to initial art teacher certification. The student assumes the total professional role as a teacher of art in an approved school setting. LEC
JUSTIFICATION

Class should not be in variable credit hours. The VAE 780 is the Internships for Student Teaching and requires a 9 hour enrollment to meet licensure Kansas State requirements for art teaching in the public schools. The VAE 780 meets the University of Kansas expectations of standards for teaching and those of the State. When students enroll in the Internship course, they student teach for a total of 16 weeks meeting the demands of a placement in schools K-12. Specifically, students are placed with an art teacher either at the elementary or secondary level for 8 weeks; for the next 8 weeks students enter another placement at grade level they have not yet taught (elementary or secondary 0 middle or high school). Ultimately, the VAE 780 placements entail that student teachers teach under the supervision of both the cooperative teacher and a university supervisor either Denise Stone or a colleague.

B. Program Changes

1. Classics

CLASSICS M.A.

The requested changes to this degree or certificate program are: Current Track or Option within degree: In the current catalog, of the 30 hours required for an M.A. in Classics, the following stipulation is added: "A maximum of 12 hours may be taken in nonlanguage courses."

Proposed: "A maximum of 12 hours may be taken in non-language courses (exception: a maximum of 15 hours may be taken by students who enroll in CLSX 899 for thesis hours)."

The reasons given for this change are these: CLSX 899 is a newly proposed course that will allow students to write an M.A. thesis with emphasis on the material remains of ancient Greece and/or Rome (rather than on the languages and literatures, for which the rubrics GRK 899 and LAT 899 are now used). Currently, all students may take up to 12 of the 30 hours required for the M.A. in related graduate courses taught in English but approved by the department (e.g., ancient philosophy in Philosophy, or Roman history in History). The proposed change will give the student writing a thesis under the new CLSX rubric the opportunity to take three more hours of this kind of class. Since this M.A. is less intensely involved in the ancient languages, such a change would allow the student a bit more flexibility in designing his or her own program of study.

2. Environmental Studies

ENVIRONMENTAL STUDIES CERTIFICATE

Requested changes: Current Number of Hours Requirement: 19 credit hours

Proposed: 12 credit hours

Current Courses Requirement: 12 hours of graduate coursework: Required: EVRN 701 Climate Change, Ecological Change, and Social Change (3). EVRN 702 Energy, Ecology, and Community in Kansas (3). Electives: EVRN 720 Topics in Environmental Studies: Climates and Borders: Monarch Butterflies and Local Economies in Mexico (3). EVRN 720 Topics in Environmental Studies: Climate Change in Greenland and the Arctic (3). Other graduate level courses TBD may serve as electives for the certificate, as long as the student’s advisor, in consultation with the instructor, designate the courses as having significant climate change content. A course having 25% climate change content is suggested as a minimum level for a course to count. This is similar to the ways some area studies programs certify their courses that count towards degrees. Additional 7 credits: Students must enroll for 4 semesters in EVRN 700 Colloquium (1). (New course recently approved). Toward the end of their program, students will enroll in EVRN 915: Capstone (3) (new course recently approved). The goal of this research seminar is to discuss individual student’s research, culminating in the completion of a paper in Environmental Studies for presentation at a professional meeting and/or publication in a professional journal.
Proposed: Required: EVRN 701 Climate Change, Ecological Change, and Social Change (3). EVRN 702 Energy, Ecology, and Community in Kansas (3). EVRN 915 Capstone (3). One elective, 500-level or above (3), chosen in consultation with the student's advisor with at least 25% climate change content.

The reasons given for this change are these: Faculty wanted to ensure the certificate was in line with other certificates in terms of credit hours. This proposal brings the certificate down from 19 to 12 credit hours. Faculty also wanted to focus the certificate on courses that would be assuredly be taught in the long term. The three required courses identified above will serve as a core curriculum for future graduate degree programs.

3. Film & Media Studies

FILM & MEDIA STUDIES RS² PROPOSAL

FMS 800: Introduction to Graduate Study in Film/Media (3)
Major emphasis is placed upon the principles of research, bibliographical data, and research methods useful in film and television. The course should be taken at the beginning of the graduate student's program. LEC

This course is an introduction to critical thinking and research methods for entering graduate students in the Department of Film and Media Studies at KU. The course has two main objectives. First, it aims to introduce graduate students to the theoretical foundations and methodologies that inform current practices within the field of Film and Media studies. This aspect of the course will be framed by major scholarly and theoretical discussions that have influenced the field. Second, the course offers a practicum for graduate study, including protocols for writing and research and the development of a scholarly focus. Our readings and discussions cover a variety of theoretical and methodological frameworks in film, television, and new media exploring the insights that each provides. Ultimately this course is designed to help you develop the critical tools and research skills that you will need to succeed as a graduate student in Film and Media.

FMS 801: Professional Development Seminar (1)
Preparation for faculty careers in film and related fields, including issues of research, teaching, and service. Specific topics and emphases vary from semester to semester. May be repeated for credit. SEM

This class is meant to help prepare graduate students for the successful completion of their individual degrees and at the same time provide them with basic training for a professional academic career in theater and/or film. Classes will be discussion/activity based and generated mostly by the students. The topics covered reflect a combination of faculty and student requests and will vary from semester to semester according to student's needs and the instructor teaching the course.

4. Mathematics

MATHEMATICS PH.D.

Current Examination Requirements Requirement: Students must currently pass three written qualifying examinations, one in algebra, one in analysis and one either in numerical analysis or probability and statistics. Proposed: Students must pass two written qualifying examinations chosen from one of the following options: (i) algebra and numerical analysis (ii) algebra and probability/statistics (iii) analysis and numerical analysis (iv) analysis and probability/statistics

Current Courses Requirement: Current track requirements: (i) Pure Mathematics. This track requires MATH 800, MATH 810, MATH 820, MATH 830 and an approved course in geometry (e.g., MATH 840, MATH 910, or MATH 920). (ii) Applied Mathematics. This track requires MATH 727 (or the corresponding qualifying examination); MATH 781 (or the corresponding qualifying examination); MATH 800, MATH 810, MATH 881 and MATH 882 or MATH 865 and MATH 866 or MATH 850 and MATH 851, and one of MATH 840, MATH 850, or MATH 950.

Proposed: (A) Qual Coursework : Prospective PhD students must pass MATH 727, MATH 765, MATH 781, and MATH 791 with a grade of B or better or pass the corresponding qualifying exam. More advanced students may
substitute corresponding 800 level courses. For example, MATH 800 or MATH 810 may substitute for MATH 765; MATH 830 or MATH 831 may substitute for MATH 791; MATH 881 or MATH 882 may substitute for MATH 781; MATH 865 or MATH 866 may substitute for MATH 727. The qual course requirement must be met before taking the preliminary exam. (B) New track requirements: Track requirements: (i) Pure Mathematics. This track requires MATH 800; MATH 810; MATH 820 or MATH 821; MATH 830 and an approved course in geometry (e.g., MATH 840, MATH 910, or MATH 920). (ii) Applied Mathematics. This track requires MATH 800; MATH 810; one of the following sequences: MATH 881-882, or MATH 865-866, or MATH 850-851; and one of MATH 840, MATH 850, or MATH 950. Any of the track courses above used to fulfill the qual course requirement must be passed with a grade of B or better.

The reasons given for this change are these: There are a number of reasons the department of mathematics would like to make the proposed changes, but the primary reason is to lessen the number of exams PhD students must take in order to get to the research phase of their PhD program. Currently the mathematics department has a three-tier exam system for PhD students: the qualifying exams, the preliminary exam, and the oral comprehensive exam. The main purpose of the qualifying exams is to ensure that students are proficient at introductory-level graduate mathematics across the field. While we have some students who come to KU prepared to take the qualifying exams upon arrival, many of our students must take the 700-level courses that prepare them for quals. Thus, even very good students often find themselves in a bind for time. It often takes them two years to complete the coursework that prepares them for three qualifying exams and generally leaves them with just enough time to finish the quals, assuming they pass all of their exams on their first attempt. Successful students at this level must then prepare for the preliminary exam - a written or oral exam in their proposed research area, and again for the oral comprehensive exam. Thus, in many cases, current students, even very good ones, spend two and a half or three years preparing for exams before beginning their research. With the proposed changes, good students, even those that need to take the 700-level courses that correspond to their quals, should be done with the initial testing after one year, and ultimately ought to begin their research 6 months to a year earlier than under the current system. Given that we are reducing the number of exams at the introductory graduate level, the new proposal also introduces a course requirement at the qual or introductory graduate level. Thus, all students would have to demonstrate proficiency in a number of areas via a combination of qualifying exams and coursework. On the other hand, because there track oriented course requirements already exist, we have designed the qual course requirement so that it dovetails with the more advanced track requirements. Thus, students may use a more advanced course that fulfills a track requirement to also fulfill a qual coursework requirement.

III. REPORT OF THE COMMITTEE ON UNDERGRADUATE STUDIES & ADVISING (CUSA)
Submitted by Lanis Atwood; presented by Chris Fischer, 2011-2012 CUSA Chair

A. Curricular Changes for Approval

BIOLOGY

CHANGE: DELETE COURSE
BIOL 660 LAKE ECOLOGY 3 N
An introduction to the biological, chemical, and physics processes that characterize ponds, lakes, and reservoirs. Discussion of current research papers. Prerequisite: General ecology (BIOL 414 or equivalent) or permission of instructor. LEC

An introduction to the biological, chemical, and physics processes that characterize ponds, lakes, and reservoirs. Discussion of current research papers. Prerequisite: General ecology (BIOL 414 or equivalent) or permission of instructor. LEC

CHANGE: COURSE DESCRIPTION TITLE PREREQUISITE
BIOL 661 STREAM ECOLOGY 3 N
Population, community, and ecosystem ecology of flowing water habitats from ephemeral creeks to great rivers. The course emphasizes biological phenomena, but physical and chemical processes are discussed. Prerequisite: BIOL 414 or equivalent, or consent of instructor. Concurrent enrollment in Stream Ecology Laboratory. BIOL 668 is recommended. LEC

ECOLOGY OF RIVERS AND LAKES  3  N

Study of the ecology and structure of creeks, rivers, ponds, lakes, and wetlands as well as some of the major human impacts. Prerequisite: One year of biology or permission of the instructor. BIOL 414 recommended.

EAST ASIAN LANGUAGES & CULTURES

CHANGE: NEW COURSE
EALC 121 INTRODUCTION TO CONTEMPORARY CHINA  3  H
An overview of contemporary Chinese culture and society since the economic reforms and opening up launched in 1978, through the study of changes in politics, the economy, society, culture and everyday life in China. The course is taught in English. No prior knowledge of Chinese language is required.

FRENCH & ITALIAN

CHANGE: COURSE DESCRIPTION
ITAL 107 ELEMENTARY ITALIAN CONVERSATION I  3  U
Offers knowledge of essential grammar and basic oral communication skills through practice in grammar, listening comprehension, and conversation. Active participation required. Strongly recommended for students with no previous study of a foreign language and minimal linguistic background as well as for students in professional schools who plan to participate in study abroad programs in Italy. Completion of both ITAL 107 and ITAL 108 is equivalent to ITAL 110 and allows students to enroll in ITAL 120. LEC

ITAL 107 ELEMENTARY ITALIAN CONVERSATION I  3  U
First part of a two-course sequence (with 108) for students with no previous study of a foreign language and minimal linguistic background as well as for students in professional schools who plan to participate in study abroad programs in Italy. Offers knowledge of essential grammar and basic oral communication skills through practice in grammar, listening comprehension, and conversation. Active participation required. Completion of both ITAL 107 and ITAL 108 is equivalent to ITAL 110 and allows students to enroll in ITAL 120. LEC

CHANGE: COURSE DESCRIPTION
ITAL 108 ELEMENTARY ITALIAN CONVERSATION II  3  U
A continuation of ITAL 107. Completion of both ITAL 107 and ITAL 108 is equivalent to ITAL 110 and allows students to enroll in ITAL 120. Prerequisite: ITAL 107 or Italian Coordinator's approval. LEC

ITAL 108 ELEMENTARY ITALIAN CONVERSATION II  3  U
A continuation of ITAL 107, second part of a two-course sequence for students with no previous study of a foreign language and minimal linguistic background as well as for students in professional schools who plan to participate in study abroad programs in Italy. Offers knowledge of essential grammar and basic oral communication skills through practice in grammar, listening comprehension, and conversation. Active participation required. Completion of both ITAL 107 and ITAL 108 is equivalent to ITAL 110 and allows students to enroll in ITAL 120. Prerequisite: ITAL 107 or Italian Coordinator's approval. LEC

CHANGE: COURSE DESCRIPTION
ITAL 110 ELEMENTARY ITALIAN I  5  U
Five hours of class. Essentials of grammar and composition, easy reading, practice in pronunciation and speaking. LEC  Prerequisite:

ITAL 110 ELEMENTARY ITALIAN I  5  U
Introduction to Italian language and culture. Essentials of grammar and practice in speaking, understanding, reading, and writing. Active participation required. Five hours of class per week.

LEC

CHANGE: COURSE DESCRIPTION
ITAL 155 INTENSIVE BASIC ITALIAN 3 U

Part of accelerated two-course sequence (with 156) for students with previous language study or strong linguistic background. Offers a basic reading and/or speaking knowledge of Italian through practice in pronunciation, grammar, translating, and writing. Double-track course is offered both to students who want a basic, passive reading/translating knowledge and an active knowledge of Italian. Prerequisite: Previous study of another language or permission of instructor. LEC

ITAL 155 INTENSIVE BASIC ITALIAN I 3 U

First part of a two-course sequence (with 156) for students with previous language study or strong linguistic background. Same content as ITAL 110 but accomplished in three hours of class per week. Active participation required. Prerequisite: Previous study of another language or permission of instructor. LEC

CHANGE: COURSE DESCRIPTION
ITAL 156 INTENSIVE BASIC ITALIAN II 3 U

A continuation of ITAL 155, second part of a two-course sequence for students with previous language study or strong linguistic background. Same content as ITAL 120 but accomplished in three hours of class per week. Active participation required. Prerequisite: ITAL 155 or permission of instructor. LEC

CHANGE: COURSE DESCRIPTION PREREQUISITE
ITAL 230 INTERMEDIATE ITALIAN I 3 U

Intensive and extensive reading of modern texts; vocabulary, idioms, and discussion in Italian of texts. Review of grammar. Prerequisite: ITAL 120. LEC

ITAL 230 INTERMEDIATE ITALIAN I 3 U

Review and expansion of grammatical structures introduced in Elementary Italian I and II, with continued practice in speaking, understanding, reading, and writing, coordinated with the study of cultural texts. Active participation required. Prerequisite: ITAL 120 or ITAL 156. LEC

CHANGE: COURSE DESCRIPTION
ITAL 240 INTERMEDIATE ITALIAN II 3 U

Continuation of ITAL 230. (ITAL 240 completes foreign language requirement.) Prerequisite: ITAL 230. LEC

ITAL 240 INTERMEDIATE ITALIAN II 3 U

Continuation of ITAL 230. (ITAL 240 completes foreign language requirement.) Review and expansion of grammatical structures introduced in Elementary Italian I and II, with continued practice in speaking, understanding, reading, and writing, coordinated with the study of cultural texts. Active participation required. Prerequisite: ITAL 230. LEC

CHANGE: COURSE DESCRIPTION
ITAL 300 COMPOSITION AND CONVERSATION 3 H

A complete review of Italian grammar and usage for the advanced student. Compositions, conversation, and supportive readings in Italian. Prerequisite: ITAL 240 or permission of instructor. LEC
ITAL 300  COMPOSITION AND CONVERSATION  3 H
(NEW) Study of advanced grammatical structures with extensive practice in writing and conversation. Guided discussions on a variety of contemporary Italian literary, journalistic, and cinematic works. Active participation required. Prerequisite: ITAL 240 or permission of instructor. LEC

CHANGE: COURSE DESCRIPTION
ITAL 315  ADVANCED COMPOSITION AND CONVERSATION  3 H
(OLD) Intensive review of grammar and usage for advanced students. Compositions, conversation, and advanced readings in Italian. Prerequisite: ITAL 300 or permission of department. LEC
ITAL 315  ADVANCED COMPOSITION AND CONVERSATION  3 H
(NEW) Continuation of ITAL 300. Study of advanced grammatical structures with extensive practice in writing and conversation. Guided discussions on a variety of contemporary Italian literary, journalistic, and cinematic works. Active participation required. Prerequisite: ITAL 300 or permission of instructor. LEC

HUMANITIES AND WESTERN CIVILIZATION

NEW COURSE: NEW CROSS-LISTED COURSE
HWC 490  ROOTS OF FEDERAL INDIAN POLICY 03
This course introduces students to the basic concepts and ideologies of US Federal Indian policy. It surveys European intellectual trends that were influential in creating policies applied to colonized native peoples. The course explores the origins of such policies, including removals, "civilization programs," the reservation period, the Dawes (Allotment) Act, the New deal, termination, relocation, NAGPRA and tribal rights, in addition to issues surrounding American Indian identity, tribal membership and demographics. This course serves as a foundation for more in-depth study of Federal Indian Law pertinent to the Indigenous peoples of the United States. (Same as ISP 490) LEC

INDIGENOUS STUDIES PROGRAM

NEW COURSE: NEW CROSS-LISTED COURSE
ISP 490  ROOTS OF FEDERAL INDIAN POLICY 03
This course introduces students to the basic concepts and ideologies surrounding modern United States Federal Indian policy. It will survey the European intellectual trends that were influential in creating policies that were (and still are) applied to the colonized Native peoples. The course will explore the roots of US Indian policy, including removals, "civilization programs," the reservation period, the Dawes (Allotment) Act, the New Deal, termination, relocation, NAGPRA and tribal rights, in addition to the issues surrounding American Indian identity, tribal membership and demographics. This course serves as the foundation for more in-depth study into the complicated and ever-changing field of Federal Indian Law as it pertains to the Indigenous peoples of the United States. (Same as HWC 490) LEC.

LINGUISTICS

CHANGE: NEW COURSE
LING 451  TOPICS IN RESEARCH IN ACQUISITION AND PROCESSING:_________  3 H
This course is primarily intended for students actively engaged in linguistic research on language acquisition, language processing, and neurolinguistics. Students in this course present and discuss study design, methods, data analysis and interpretation of results for their research projects. Professional development topics such as CV development, applications for fellowships, grants and
jobs, and the dissemination of research findings are also discussed. May be repeated. Prerequisite: Permission of instructor.

**VISUAL ART**

**CHANGE: NUMBER**

TD 301  WEAVE STRUCTURES  3  U

*OLD*  Continuation of TD 314. Research and analysis of multiple-harness weave structures. Weave drafts. Design problems to develop the use of color, form, and surface in simple and compound weaves.

*Prerequisite:* TD 314. LAB

TD 401  WEAVE STRUCTURES  3  U

*NEW*  Continuation of TD 314. Research and analysis of multiple-harness weave structures. Weave drafts. Design problems to develop the use of color, form, and surface in simple and compound weaves.

*Prerequisite:* TD 314. LAB

**CHANGE: NUMBER**

TD 302  TECHNIQUES IN WEAVING  3  U

*OLD*  Development of individual art and design concepts in relation to woven structures and/or forms.

*Emphasis on weaver-controlled techniques used to create images and composition. Prerequisite:* TD 314. LAB

TD 402  TECHNIQUES IN WEAVING  3  U

*NEW*  Development of individual art and design concepts in relation to woven structures and/or forms.

*Emphasis on weaver-controlled techniques used to create images and composition. Prerequisite:* TD 314. LAB

**CHANGE: NUMBER**

TD 303  EXPERIMENTAL CONCEPTS IN WEAVING  3  U

*OLD*  Experimentation with resist dyeing, painted warps and/or "Fiber Forms" techniques in woven structures. Individual research and development of thematic concepts.

*Prerequisite:* TD 313, and TD 301 or TD 302. LAB

TD 405  EXPERIMENTAL CONCEPTS IN WEAVING  3  U

*NEW*  Experimentation with resist dyeing, painted warps and/or "Fiber Forms" techniques in woven structures. Individual research and development of thematic concepts.

*Prerequisite:* TD 313, and TD 301 or TD 302. LAB

**CHANGE: CREDIT**

VAE 497  INDEPENDENT STUDY  1-2  H

*OLD*  Only one enrollment permitted each semester; a maximum of four hours will apply toward the bachelor's degree. *Prerequisite:* Recommendation of adviser and consent of instructor. IND

VAE 497  INDEPENDENT STUDY  1-3  H

*NEW*  Only one enrollment permitted each semester; a maximum of four hours will apply toward the bachelor's degree. *Prerequisite:* Recommendation of adviser and consent of instructor. IND

**CHANGE: CREDIT**

VAE 500  STUDENT TEACHING  1-6  H

*OLD*  A supervised teaching experience in an approved school setting, with level and subject area to be selected according to the teaching field. *Prerequisite:* Admission to the student teaching program. FLD *Prerequisite:* FLD

VAE 500  STUDENT TEACHING  6  H

*NEW*  A supervised teaching experience in an approved school setting, with level and subject area to be selected according to the teaching field. *Prerequisite:* Admission to the student teaching program. FLD

**Chemistry Course Changes for Approval:**
ATMOSPHERIC SCIENCE

CHANGE: PREREQUISITE

ATMO 525  AIR POLLUTION METEOROLOGY  3  S
(OLD)   A study of background levels and concentrated sources of atmospheric pollution together with considerations of pollution buildup in urban areas as related to particular weather conditions. Inadvertent weather modifications and effects of atmospheric pollution on particular weather events and general climate will be discussed. Prerequisite: ATMO 105, MATH 121, EECS 138 and CHEM 184.

ATMO 525  AIR POLLUTION METEOROLOGY  3  S
(NEW)   A study of background levels and concentrated sources of atmospheric pollution together with considerations of pollution buildup in urban areas as related to particular weather conditions. Inadvertent weather modifications and effects of atmospheric pollution on particular weather events and general climate will be discussed. Prerequisite: ATMO 105, MATH 121, EECS 138 and CHEM 130 or equivalent.

BIOLOGY

CHANGE: PREREQUISITE

BIOL 150  PRINCIPLES OF MOLECULAR AND CELLULAR BIOLOGY  4  N
(OLD)   An integrated lecture and laboratory course for biology majors and students planning to take additional courses in biology. This course covers basic biochemistry, cell structure and function, molecular biology, genetics, physiology, and development of plants and animals. Three hours of lecture and two hours of laboratory per week. An honors section (BIOL 151) is offered for students with superior academic records. Prerequisite: Concurrent or prior enrollment in CHEM 184, or consent of instructor.

BIOL 150  PRINCIPLES OF MOLECULAR AND CELLULAR BIOLOGY  4  N
(NEW)   An integrated lecture and laboratory course for biology majors and students planning to take additional courses in biology. This course covers basic biochemistry, cell structure and function, molecular biology, genetics, physiology, and development of plants and animals. Three hours of lecture and two hours of laboratory per week. An honors section (BIOL 151) is offered for students with superior academic records. Prerequisite: Concurrent or prior enrollment in CHEM 130, or consent of instructor.

CHANGE: PREREQUISITE

BIOL 151  PRINCIPLES OF MOLECULAR AND CELLULAR BIOLOGY, HONORS  4  N
(OLD)   An integrated lecture and laboratory course for students with superior academic records who are biology majors or who plan to take additional courses in biology. This course covers basic biochemistry, cell structure and function, molecular biology, genetics, physiology, and development of plants and animals. Three hours of lecture and two hours of laboratory per week. Concurrent or prior enrollment in CHEM 184 is recommended. Prerequisite: Membership in the University Honors Program or permission of instructor.

BIOL 151  PRINCIPLES OF MOLECULAR AND CELLULAR BIOLOGY, HONORS  4  N
(NEW)   An integrated lecture and laboratory course for students with superior academic records who are biology majors or who plan to take additional courses in biology. This course covers basic biochemistry, cell structure and function, molecular biology, genetics, physiology, and development of plants and animals. Three hours of lecture and two hours of laboratory per week. Prerequisite: concurrent or prior enrollment in CHEM 130 and membership in the University Honors Program, or consent of instructor.

CHANGE: PREREQUISITE

BIOL 408  PHYSIOLOGY OF ORGANISMS  3  N
A comprehensive and integrative approach to the study of organisms with an emphasis on physiological, ecological, structural, and behavioral adaptations to differing environments. Prerequisite: BIOL 152, or BIOL 153, and CHEM 184, or consent of the instructor.

**BIOL 408**
**PHYSIOLOGY OF ORGANISMS**  3 N

A comprehensive and integrative approach to the study of organisms with an emphasis on physiological, ecological, structural, and behavioral adaptations to differing environments. Prerequisite: BIOL 152, or BIOL 153, and CHEM 130, or consent of the instructor.

**change: prerequisite**

**BIOL 416**
**CELL STRUCTURE AND FUNCTION**  3 N

Lecture survey of molecular cell biology with emphasis on experimental approaches to understanding cell function; topics include biological membranes and transmembrane transport, vesicular trafficking (secretion and endocytosis), cell signaling, cell motility and the cytoskeleton, and the regulation of the cell division cycle. Prerequisite: BIOL 150, BIOL 350, CHEM 184 and CHEM 188, or consent of the instructor.

**BIOL 416**
**CELL STRUCTURE AND FUNCTION**  3 N

Lecture survey of molecular cell biology with emphasis on experimental approaches to understanding cell function; topics include biological membranes and transmembrane transport, vesicular trafficking (secretion and endocytosis), cell signaling, cell motility and the cytoskeleton, and the regulation of the cell division cycle. Prerequisite: BIOL 150, BIOL 350, CHEM 130 and CHEM 135, or consent of the instructor.

**change: prerequisite**

**BIOL 426**
**LABORATORY IN CELL BIOLOGY**  3 N

Laboratory exercises will examine the function, organization, and composition of eukaryotic cells. Prerequisite: BIOL 150 and CHEM 184, concurrent or prior enrollment in BIOL 416, or consent of the instructor. BIOL 350 is highly recommended. Prerequisite:

**BIOL 426**
**LABORATORY IN CELL BIOLOGY**  3 N

Laboratory exercises will examine the function, organization, and composition of eukaryotic cells. Prerequisite: BIOL 150 and CHEM 130, concurrent or prior enrollment in BIOL 416, or consent of the instructor. BIOL 350 is highly recommended.

**change: prerequisite**

**BIOL 594**
**FOREST ECOSYSTEMS**  3 N

Students learn basic concepts of forest productivity, forest water relations, forest hydrology, nutrient cycling, through soils and vegetation, nutrient uptake, carbon cycling, decomposition, linkages to aquatic ecosystems, and agents of disturbance to these cycles. The class spends a significant part of the semester exploring forest soil profiles and the challenges they present to different forest ecosystems. We discuss the function of forested ecosystems in a global context and identify and understand smaller-scale processes that drive forest function. Prerequisite: CHEM 188 and BIOL 414.

**BIOL 594**
**FOREST ECOSYSTEMS**  3 N

Students learn basic concepts of forest productivity, forest water relations, forest hydrology, nutrient cycling, through soils and vegetation, nutrient uptake, carbon cycling, decomposition, linkages to aquatic ecosystems, and agents of disturbance to these cycles. The class spends a significant part of the semester exploring forest soil profiles and the challenges they present to different forest ecosystems. We discuss the function of forested ecosystems in a global context and identify and understand smaller-scale processes that drive forest function. Prerequisite: CHEM 135 and BIOL 414.

**change: prerequisite**

**BIOL 636**
**BIOCHEMISTRY I**  3 N

First semester of a two-semester lecture course in introductory biochemistry. Emphasis upon the physical structure of macromolecules and membranes, enzyme structure/function, and enzyme kinetics. Prerequisite: CHEM 626 or consent of instructor.

**BIOL 636**
**BIOCHEMISTRY I**  3 N
First semester of a two-semester lecture course in introductory biochemistry. Emphasis upon the physical structure of macromolecules and membranes, enzyme structure/function, and enzyme kinetics. Prerequisite: CHEM 235 or consent of instructor.

CHANGE: PREREQUISITE COURSE IS CURRENTLY CROSSLISTED

BIOL 656 ECOSYSTEM ECOLOGY 3 N

(OLD) An introduction to the patterns and processes that affect terrestrial ecosystems. Emphasis is placed on understanding nutrient cycles (e.g., carbon nitrogen phosphorous), hydrologic cycles, and patterns of net primary productivity. The role of both natural and anthropogenic disturbances in structuring terrestrial ecosystems is examined in the context of global land-use patterns. Discussion of current research literature will be expected. (Same as EVRN 656.) Prerequisite: BIOL 414 and CHEM 184.

BIOL 656 ECOSYSTEM ECOLOGY 3 N

(NEW) An introduction to the patterns and processes that affect terrestrial ecosystems. Emphasis is placed on understanding nutrient cycles (e.g., carbon nitrogen phosphorous), hydrologic cycles, and patterns of net primary productivity. The role of both natural and anthropogenic disturbances in structuring terrestrial ecosystems is examined in the context of global land-use patterns. Discussion of current research literature will be expected. (Same as EVRN 656.) Prerequisite: BIOL 414 and CHEM 130.

CHANGE: PREREQUISITE

BIOL 662 AQUATIC ECOLOGY LABORATORY 2 N

(OLD) A field and laboratory course introducing biological, physical, and chemical characteristics of lentic (ponds and lakes) and lotic (creeks and rivers) habitats. Students learn sampling and monitoring techniques and how to classify aquatic biota at higher taxonomic levels. Co- or prerequisite: CHEM 184 and either BIOL 660 or 661.

BIOL 662 AQUATIC ECOLOGY LABORATORY 2 N

(NEW) A field and laboratory course introducing biological, physical, and chemical characteristics of lentic (ponds and lakes) and lotic (creeks and rivers) habitats. Students learn sampling and monitoring techniques and how to classify aquatic biota at higher taxonomic levels. Co- or prerequisite: CHEM 130 and either BIOL 660 or 661.

CHEMISTRY

CHANGE: NEW COURSE

CHEM 170 CHEMISTRY FOR THE CHEMICAL SCIENCES I 5 N

The first course in a two-course sequence focused on the principles and applications of modern chemistry. This integrated lecture and laboratory course is designed for students pursuing or considering a major in one of the chemical sciences (such as chemistry, biochemistry, chemical engineering or petroleum engineering). The CHEM 170/175 course sequence covers the same general topics as CHEM 130/135, but with an increased emphasis on modern applications of chemistry. Students with credit in CHEM 125 will have two hours added on to their total number of hours required for graduation. Prerequisite: eligibility for MATH 115. LEC

CHANGE: NEW COURSE

CHEM 175 CHEMISTRY FOR THE CHEMICAL SCIENCES II 5 N

An integrated lecture and laboratory course which is a continuation of CHEM 170. Prerequisite: CHEM 130, 170 or 190. LEC

CHANGE: COURSE DESCRIPTION NUMBER TITLE

CHEM 184 FOUNDATIONS OF CHEMISTRY I 5 N

(OLD) This course seeks to develop a working knowledge of the conceptual foundation and the quantitative chemical relationships on which subsequent chemistry courses are built. Atomic structure, chemical bonding, properties of gases, liquids, and solids, acid-base chemistry, and chemical equilibria are emphasized. The class meets each week for three one-hour lectures, a one-hour tutorial period, and a three-hour laboratory. Students with credit in CHEM 125 will have two hours added on to their total number of hours required for graduation. Prerequisite: Must be eligible for MATH 115. LEC
CHEM 130  GENERAL CHEMISTRY I  5  N
(NEW) This course seeks to develop a working knowledge of the conceptual foundation and the quantitative chemical relationships on which subsequent chemistry courses are built. Atomic structure, chemical bonding, reaction stoichiometry, thermochemistry, and periodic trends are emphasized in this integrated lecture and laboratory course. Students pursuing or considering a major in one of the chemical sciences should strongly consider taking CHEM 170 or 190. Students with credit in CHEM 125 will have two hours added on to their total number of hours required for graduation. Prerequisite: Must be eligible for MATH 115. LEC

CHANGE: COURSE DESCRIPTION  NUMBER
CHEM 185  FOUNDATIONS OF CHEMISTRY I, HONORS  5  N
(OLD) This course, which is designed for qualified and motivated students having a strong interest in chemistry, provides a more thorough treatment of the concepts and topics covered in CHEM 184 and CHEM 186. It is anticipated that students in CHEM 185 plan to take more than one year of chemistry at the college level. Class meets each week for three one-hour lectures, a one-hour tutorial period, and a three-hour lab. Students with credit in CHEM 125 will have two hours added on to their total number of hours required for graduation. Prerequisite: high-school chemistry and calculus; at least one of the following: (a) acceptance into the KU Honors Program, (b) an AP exam score in chemistry of 3 or higher, (c) a mathematics ACT score of 28 or higher; or permission of instructor. LEC

CHEM 190  FOUNDATIONS OF CHEMISTRY I, HONORS  5  N
(NEW) This integrated lecture and laboratory course, which is designed for qualified and motivated students having a strong interest in chemistry, provides a more thorough treatment of the concepts and topics covered in CHEM 130 and CHEM 170. It is anticipated that students in CHEM 190 plan to take more than one year of chemistry at the college level. Students with credit in CHEM 125 will have two hours added on to their total number of hours required for graduation. Prerequisite: high-school chemistry and calculus; at least one of the following: (a) acceptance into the KU Honors Program, (b) an AP exam score in chemistry of 3 or higher, (c) a mathematics ACT score of 28 or higher; or permission of instructor. LEC

CHANGE: COURSE DESCRIPTION  PREREQUISITE  NUMBER  TITLE
CHEM 188  FOUNDATIONS OF CHEMISTRY II  5  N
(OLD) This course is a continuation of CHEM 184 and provides an introduction to inorganic chemistry and qualitative and quantitative analysis. Electrochemistry, thermodynamics, chemical kinetics, and coordination chemistry are stressed. The class meets each week for three one-hour lectures, an optional tutorial period, and a five-hour laboratory. Prerequisite: CHEM 184. LEC

CHEM 135  GENERAL CHEMISTRY II  5  N
(NEW) This course, which is a continuation of CHEM 130, focuses on chemical kinetics, chemical equilibrium, acid-base chemistry, and thermodynamics. Additional topics, such as environmental chemistry, electrochemistry, coordination chemistry, nuclear chemistry, organic chemistry, and/or polymers, may also be introduced in this integrated lecture and laboratory course. Students pursuing or considering a major in one of the chemical sciences should strongly consider taking CHEM 175 or 195. Prerequisite: CHEM 130, 170 or 190. LEC

CHANGE: COURSE DESCRIPTION  PREREQUISITE  NUMBER
CHEM 189  FOUNDATIONS OF CHEMISTRY II, HONORS  5  N
(OLD) A course designed for qualified and motivated students with strong interest in chemistry to provide a more thorough treatment of the concepts and topics of advanced general chemistry. It is anticipated that the students in CHEM 189 have completed CHEM 185 or excelled in CHEM 184. Prerequisite: Membership in the University Honors Program, CHEM 184, CHEM 185, or consent of the department. LEC

CHEM 195  FOUNDATIONS OF CHEMISTRY II, HONORS  5  N
(NEW) CHEM 195: Foundations of Chemistry II, Honors (5) N
A course designed for qualified and motivated students with strong interest in chemistry to provide a more thorough treatment of the concepts and topics of advanced general chemistry. It is anticipated
that the students in CHEM 195 have completed CHEM 190 or excelled in CHEM 130 or 170. Prerequisite: Membership in the University Honors Program, CHEM 130, CHEM 170 or CHEM 190, or consent of the department. LEC

CHANGE: COURSE DESCRIPTION PREREQUISITE NUMBER
CHEM 516 ANALYTICAL CHEMISTRY 3 N
(OLD) Principles of analytical chemistry with emphasis on the fundamental reactions used for chemical analysis. Topics include chemical equilibria in acid/base, complexation, separations, and redox systems, data analysis, and potentiometry. Three class periods per week. Prerequisite: CHEM 188, CHEM 622 or CHEM 624, CHEM 625, and concurrent enrollment in CHEM 517. LEC

CHEM 620 ANALYTICAL CHEMISTRY 3 N
(NEW) Principles of analytical chemistry with emphasis on the fundamental reactions used for chemical analysis. Topics include chemical equilibria in acid/base, complexation, separations, and redox systems, data analysis, potentiometry and spectrophotometry. Prerequisites: one semester of organic chemistry and organic chemistry laboratory, CHEM 535 or CHEM 510 (or concurrent enrollment in CHEM 510), or permission of instructor. Corequisite: CHEM 621. LEC

CHANGE: COURSE DESCRIPTION PREREQUISITE NUMBER
CHEM 517 ANALYTICAL CHEMISTRY LABORATORY 2 U
(OLD) Experiments illustrate fundamental principles of chemical analysis methods. The course serves as an introduction to advanced instrumental methods of analysis. One five-hour laboratory and one fifty minute lecture each week. Prerequisite: CHEM 188, CHEM 622 or CHEM 624, CHEM 625, and concurrent enrollment in CHEM 516. LAB Prerequisite:

CHEM 621 ANALYTICAL CHEMISTRY LABORATORY 2 U
(NEW) Experiments illustrate fundamental principles of chemical analysis methods. The course serves as an introduction to advanced instrumental methods of analysis. Prerequisites: one semester of organic chemistry and organic chemistry laboratory, CHEM 535 or CHEM 510 (or concurrent enrollment in CHEM 510), or permission of instructor. Corequisite: CHEM 620. LAB

CHANGE: COURSE DESCRIPTION PREREQUISITE NUMBER
CHEM 622 FUNDAMENTALS OF ORGANIC CHEMISTRY 3 N
(OLD) A study of the structures and reactions of important classes of organic compounds. Along with the organic laboratory, CHEM 231, this course will fulfill the needs of students requiring a single semester of organic chemistry. Students requiring more than one semester of organic chemistry should enroll in CHEM 624. Prerequisite: CHEM 188. LEC

CHEM 210 FUNDAMENTALS OF ORGANIC CHEMISTRY 3 N
(NEW) A study of the structures and reactions of important classes of organic compounds. Along with the organic laboratory, CHEM 231, this course will fulfill the needs of students requiring a single semester of organic chemistry. Students requiring more than one semester of organic chemistry should enroll in CHEM 230. Prerequisite: CHEM 135, 175 or 195. LEC

CHANGE: COURSE DESCRIPTION PREREQUISITE NUMBER
CHEM 624 ORGANIC CHEMISTRY I 3 N
(OLD) Three class periods each week. A study of the structure and reactivity of selected classes of organic compounds. CHEM 624 is the first course of a two-semester sequence. Students who require only one semester of organic chemistry should enroll in CHEM 622. Students with credit in CHEM 622 will have two hours added on to their total number of hours required for graduation. Prerequisite: CHEM 188. LEC Three class periods each week. A study of the structure and reactivity of selected classes of organic compounds. CHEM 624 is the first course of a two-semester sequence. Students who require only one semester of organic chemistry should enroll in CHEM 622. Students with credit in CHEM 622 will have two hours added on to their total number of hours required for graduation. Prerequisite: CHEM 188. LEC

CHEM 230 ORGANIC CHEMISTRY I 3 N
(NEW) A study of the structure and reactivity of selected classes of organic compounds. CHEM 230 is the first course of a two-semester sequence. Students who require only one semester of organic chemistry should enroll in CHEM 210. Students with credit in CHEM 210 will have two hours
added on to their total number of hours required for graduation. Prerequisite: CHEM 135, 175 or 195. LEC

CHANGE: COURSE DESCRIPTION PREREQUISITE NUMBER
CHEM 625 ORGANIC CHEMISTRY I LABORATORY 2 U
(OLD) One five-hour laboratory and one one-hour lecture each week. Emphasis on basic techniques for the preparation, separation, and purification of organic compounds. Required for a major in chemistry and by those departments and programs specifying a complete undergraduate organic chemistry course. Prerequisite: CHEM 622 or CHEM 624, or concurrently. LAB

CHEM 231 ORGANIC CHEMISTRY I LABORATORY 2 U
(NEW) Emphasis on basic techniques for the preparation, separation, and purification of organic compounds. Required for a major in chemistry and by those departments and programs specifying a complete undergraduate organic chemistry course. Prerequisite or corequisite: CHEM 210 or CHEM 230 or CHEM 280. LAB

CHANGE: COURSE DESCRIPTION PREREQUISITE NUMBER
CHEM 626 ORGANIC CHEMISTRY II 3 N
(OLD) Three class periods each week. A continuation of CHEM 624, intended for students who want further training in organic chemistry. Prerequisite: CHEM 624. LEC

CHEM 235 ORGANIC CHEMISTRY II 3 N
(NEW) A continuation of CHEM 230, intended for students who want further training in organic chemistry. Prerequisite: CHEM 230 or CHEM 280. LEC

CHANGE: COURSE DESCRIPTION PREREQUISITE NUMBER
CHEM 627 ORGANIC CHEMISTRY II LABORATORY 2 U
(OLD) One five-hour laboratory period and one one-hour lecture each week. More advanced organic laboratory techniques with emphasis on modern spectroscopic methods for determining the structure and purity of organic compounds. Required by all programs which specify a full year of organic chemistry. Prerequisite: CHEM 625 and CHEM 626 or CHEM 626 concurrently. LAB

CHEM 236 ORGANIC CHEMISTRY II LABORATORY 2 U
(NEW) More advanced organic laboratory techniques with emphasis on modern spectroscopic methods for determining the structure and purity of organic compounds. Prerequisite: CHEM 231. Prerequisite or corequisite: CHEM 235 or CHEM 285. LAB

CHANGE: COURSE DESCRIPTION PREREQUISITE NUMBER
CHEM 628 ORGANIC CHEMISTRY I, HONORS 3 H
(OLD) Three class periods and one tutorial period each week. This is the first half of a two-semester sequence in organic chemistry for students with strong records in previous chemistry courses and who are planning or considering a major in a chemistry-related field. The content is similar to that of CHEM 624 but with coverage in greater depth and more emphasis on developing problem-solving skills. Students requiring only one semester of organic chemistry should not enroll in this course but take CHEM 622. Students with credit in CHEM 622 who take and complete CHEM 628 will have two hours added to their total number of credit hours required for graduation. Prerequisite: CHEM 188 or CHEM 189 and membership in the University Honors Program or consent of instructor. LEC

CHEM 280 ORGANIC CHEMISTRY I, HONORS 3 H
(NEW) This is the first half of a two-semester sequence in organic chemistry for students with strong records in previous chemistry courses and who are planning or considering a major in a chemistry-related field. The content is similar to that of CHEM 230 but with coverage in greater depth and more emphasis on developing problem-solving skills. Students requiring only one semester of organic chemistry should not enroll in this course but take CHEM 210. Students with credit in CHEM 210 who take and complete CHEM 280 will have two hours added to their total number of credit hours required for graduation. Prerequisite: CHEM 135, 175 or 195 and membership in the University Honors Program or consent of instructor. LEC
CHANGE: COURSE DESCRIPTION  PREREQUISITE  NUMBER

CHEM 630 ORGANIC CHEMISTRY II, HONORS  3 N
(OLD) Three class periods and one tutorial period each week. This is the second course in a two-semester sequence in organic chemistry for students with strong records in previous chemistry courses and who are planning or considering a major in chemistry or in a chemistry-related field. The content is similar to that of CHEM 626 but with coverage in greater depth and more emphasis on developing problem-solving skills. Prerequisite: CHEM 624 or CHEM 628 and membership in the University Honors Program, or consent of instructor. LEC

CHEM 285 ORGANIC CHEMISTRY II, HONORS  3 N
(NEW) This is the second course in a two-semester sequence in organic chemistry for students with strong records in previous chemistry courses and who are planning or considering a major in chemistry or in a chemistry-related field. The content is similar to that of CHEM 235 but with coverage in greater depth and more emphasis on developing problem-solving skills. Prerequisite: CHEM 230 or CHEM 280 and membership in the University Honors Program, or consent of instructor. LEC

CHANGE: COURSE DESCRIPTION  PREREQUISITE

CHEM 635 INSTRUMENTAL METHODS OF ANALYSIS  2 U
(OLD) Theory and application of instrumental methods to modern analytical problems. Topics covered include atomic and molecular spectroscopy, electrochemistry, mass spectrometry, and separations. Two class periods per week. Students must be enrolled concurrently in CHEM 636. Prerequisite: CHEM 516 and CHEM 517. CHEM 640 or CHEM 646 strongly recommended. Corequisite: CHEM 636. LEC

CHEM 635 INSTRUMENTAL METHODS OF ANALYSIS  2 U
(NEW) Theory and application of instrumental methods to modern analytical problems. Topics covered include atomic and molecular spectroscopy, electrochemistry, mass spectrometry, and separations. Prerequisites: CHEM 620 and CHEM 621 and one semester of physical chemistry laboratory, or permission of instructor. Corequisite: CHEM 636. LEC

CHANGE: COURSE DESCRIPTION  PREREQUISITE

CHEM 636 INSTRUMENTAL METHODS OF ANALYSIS LABORATORY  2 U
(OLD) Theory and application of instrumental methods to modern analysis problems. Experiments covered include atomic and molecular spectroscopy, electrochemistry, and separation methods. One five-hour laboratory each week. Students must be enrolled concurrently in CHEM 635. Prerequisite: CHEM 516 and CHEM 517. A course in physical chemistry is strongly recommended. Corequisite: CHEM 635. LAB

CHEM 636 INSTRUMENTAL METHODS OF ANALYSIS LABORATORY  2 U
(NEW) Theory and application of instrumental methods to modern analysis problems. Experiments covered include atomic and molecular spectroscopy, electrochemistry, and separation methods. Prerequisites: CHEM 620 and CHEM 621 and one semester of physical chemistry laboratory, or permission of instructor. Corequisite: CHEM 635. LAB

CHANGE: NUMBER

CHEM 640 BIOLOGICAL PHYSICAL CHEMISTRY  3 N
(OLD) A one semester course, designed particularly for biology, biochemistry, and premedical students, which surveys the fundamentals of physical chemistry. The basic principles of thermodynamics, chemical kinetics, quantum chemistry, and spectroscopy will be introduced, and their application to aqueous solutions and biochemical systems will be emphasized. Prerequisite: One semester of organic chemistry, two semesters of calculus, and two semesters of physics. LEC

CHEM 510 BIOLOGICAL PHYSICAL CHEMISTRY  3 N
(NEW) A one semester course, designed particularly for biology, biochemistry, and premedical students, which surveys the foundations of physical chemistry. The basic principles of thermodynamics, chemical kinetics, quantum chemistry, and spectroscopy will be introduced, and their application to aqueous solutions and biochemical systems will be emphasized. Prerequisite: One semester of organic chemistry, two semesters of calculus, and two semesters of physics. LEC

CHANGE: PREREQUISITE  NUMBER
CHEM 641 BIOLOGICAL PHYSICAL CHEMISTRY LABORATORY 2 U
(OLD) A course particularly for biology, biochemistry, and premedical students. Experiments in physical chemistry illustrating the fundamental principles of quantum mechanics, spectroscopy, thermodynamics, and kinetics as applied to chemical systems. Prerequisite: CHEM 640. LAB

CHEM 511 BIOLOGICAL PHYSICAL CHEMISTRY LABORATORY 2 U
(NEW) A course particularly for biology, biochemistry, and premedical students. Experiments in physical chemistry illustrating the fundamental principles of quantum mechanics, spectroscopy, thermodynamics, and kinetics as applied to chemical systems. Prerequisite: CHEM 510. LAB

CHANGE: PREREQUISITE NUMBER
CHEM 646 PHYSICAL CHEMISTRY I 3 N
(OLD) An introduction to the basic principles of quantum mechanics, atomic and molecular structure, molecular rotations and vibrations, group theory, spectroscopy, and statistical mechanics. Prerequisite: CHEM 188; PHSX 211 and PHSX 212; MATH 121, MATH 122 and MATH 220 or MATH 320; and completion of, or concurrent enrollment in MATH 290 or consent of instructor. LEC

CHEM 530 PHYSICAL CHEMISTRY I 3 N
(NEW) An introduction to the basic principles of quantum mechanics, atomic and molecular structure, molecular rotations and vibrations, group theory, spectroscopy, and statistical mechanics. Prerequisite: CHEM 135, 175 or 195; PHSX 211 and PHSX 212; MATH 121, MATH 122 and MATH 220 or MATH 320; and completion of, or concurrent enrollment in MATH 290 or consent of instructor. LEC

CHANGE: PREREQUISITE NUMBER
CHEM 647 PHYSICAL CHEMISTRY I LABORATORY 2 U
(OLD) Experiments in physical chemistry, with emphasis on the fundamental principles of quantum mechanics and spectroscopy as applied to chemical systems. Prerequisite: CHEM 646. LAB

CHEM 531 PHYSICAL CHEMISTRY I LABORATORY 2 U
(NEW) Experiments in physical chemistry, with emphasis on the fundamental principles of quantum mechanics and spectroscopy as applied to chemical systems. Prerequisite: CHEM 530. LAB

CHANGE: PREREQUISITE NUMBER
CHEM 648 PHYSICAL CHEMISTRY II 4 N
(OLD) Emphasizes the thermodynamics of molecular systems with application to the structure and properties of gases, liquids, solids, materials, statistical thermodynamics, chemical kinetics, and reaction dynamics. Prerequisite: CHEM 646 and MATH 290 or consent of instructor. LEC

CHEM 535 PHYSICAL CHEMISTRY II 4 N
(NEW) Emphasizes the thermodynamics of molecular systems with application to the structure and properties of gases, liquids, solids, materials, statistical thermodynamics, chemical kinetics, and reaction dynamics. Prerequisite: CHEM 530 and MATH 290 or consent of instructor. LEC

CHANGE: COURSE DESCRIPTION PREREQUISITE NUMBER
CHEM 649 PHYSICAL CHEMISTRY II LABORATORY 2 U
(OLD) One four-hour laboratory and one one-hour lecture per week. Experiments in physical chemistry, with emphasis on the fundamental principles of chemical thermodynamics and kinetics. Prerequisite: CHEM 648 or consent of instructor. LEC Prerequisite:

CHEM 536 PHYSICAL CHEMISTRY II LABORATORY 2 U
(NEW) Experiments in physical chemistry, with emphasis on the fundamental principles of chemical thermodynamics and kinetics. Prerequisite: CHEM 535 or consent of instructor. LEC

CHANGE: PREREQUISITE NUMBER
CHEM 667 SYSTEMATIC INORGANIC CHEMISTRY 3 N
(OLD) A systematic study of the elements and their compounds, emphasizing the relationship between properties of substances and their atomic and molecular structures and the positions of the elements in the periodic systems. Prerequisite: CHEM 640 or CHEM 646 or CHEM 648, or CHEM 648 concurrently. LEC
CHEM 660  SYSTEMATIC INORGANIC CHEMISTRY  3 N

A systematic study of the elements and their compounds, emphasizing the relationship between properties of substances and their atomic and molecular structures and the positions of the elements in the periodic systems. Prerequisite: CHEM 510 or CHEM 530. LEC

CHANGE: PREREQUISITE NUMBER
CHEM 668  ADVANCED INORGANIC LABORATORY  2 U

Experiments concerning the synthesis and characterization of inorganic compounds. Prerequisite: CHEM 667 or concurrent enrollment in CHEM 667. LAB

CHEM 661  ADVANCED INORGANIC LABORATORY  2 U

Experiments concerning the synthesis and characterization of inorganic compounds. Prerequisite: CHEM 660 or concurrent enrollment in CHEM 660. LAB

ENVIRONMENTAL STUDIES

CHANGE: PREREQUISITE          COURSE IS CURRENTLY CROSSLISTED
EVRN 335  INTRODUCTION TO SOIL GEOGRAPHY  4 N

(OLD)
The course focuses on the properties and processes of soils as they occur in their environment. The student is introduced to the nature of soil as it functions as a body; genesis of soils; properties of soil solids, especially colloids; soil chemical composition, properties, and reactions; interaction between solid, liquid, and gaseous components in soils; plant-soil-water relationships; biological interactions with soil; classification of soils; and the distribution of soils on the landscape. Not open to students who have taken GEOG 535/EVRN 535. Prerequisite GEOG 104 or GEOL 101 or consent of instructor; BIOL 100 and CHEM 184 or CHEM 185 recommended.

EVRN 335  INTRODUCTION TO SOIL GEOGRAPHY  4 N

(NEW)
The course focuses on the properties and processes of soils as they occur in their environment. The student is introduced to the nature of soil as it functions as a body; genesis of soils; properties of soil solids, especially colloids; soil chemical composition, properties, and reactions; interaction between solid, liquid, and gaseous components in soils; plant-soil-water relationships; biological interactions with soil; classification of soils; and the distribution of soils on the landscape. Not open to students who have taken GEOG/EVRN 335. Prerequisite GEOG 104 or GEOL 101 or consent of instructor; BIOL 100 and CHEM 130 or CHEM 190 recommended.

CHANGE: PREREQUISITE          COURSE IS CURRENTLY CROSSLISTED
EVRN 535  SOIL GEOGRAPHY  5 N

(OLD)
A broad study of the principles and properties of soils and their distribution on the landscape. Topics covered include: pedology, clay mineralogy, soil physics, soil chemistry, management of soils, soil biology, taxonomy, and soil geomorphology. Laboratory section and a field project are required. Not open to students who have taken GEOG/EVRN 335. Prerequisite: GEOG 104 or GEOL 101 or consent of the instructor; BIOL 100 and CHEM 184 or 185 recommended.

EVRN 535  SOIL GEOGRAPHY  5 N

(NEW)
A broad study of the principles and properties of soils and their distribution on the landscape. Topics covered include: pedology, clay mineralogy, soil physics, soil chemistry, management of soils, soil biology, taxonomy, and soil geomorphology. Laboratory section and a field project are required. Not open to students who have taken GEOG/EVRN 335. Prerequisite: GEOG 104 or GEOL 101 or consent of the instructor; BIOL 100 and CHEM 130 or 190 recommended.

CHANGE: PREREQUISITE          COURSE IS CURRENTLY CROSSLISTED
EVRN 538  ENVIRONMENTAL SOIL PHYSICS AND CHEMISTRY  4 N

(OLD)
This course examines the physical and chemical properties of soils and methods of evaluation. Physical topics include the movement of water, heat, gases, and solutes through soil. Chemistry topics include solid and solution speciation, mineral solubility, ion exchange, and oxidation-reduction reactions in soils. Prerequisite: GEOG/EVRN 335, or GEOG/EVRN 535; CHEM 188/189, MATH 121, and PHSX 114, or consent of instructor.
EVRN 538  ENVIRONMENTAL SOIL PHYSICS AND CHEMISTRY  4 N
This course examines the physical and chemical properties of soils and methods of evaluation. Physical topics include the movement of water, heat, gases, and solutes through soil. Chemistry topics include solid and solution speciation, mineral solubility, ion exchange, and oxidation-reduction reactions in soils. Prerequisite: GEOG/EVRN 335, or GEOG/EVRN 535; CHEM 135/195, MATH 121, and PHSX 114, or consent of instructor.

CHANGE: PREREQUISITE
EVRN 611  WATER QUALITY, LAND USE, AND WATERSHED ECOSYSTEMS  3 N
(OLD)
Water quality issues are integrated with land use planning and the development of watershed management strategies. Interrelationships among the hydrologic cycle, atmospheric deposition, nutrient transformations and pesticide use are examined in regards to stream, lake, and groundwater quality. Prerequisite: CHEM 125 or CHEM 184 and BIOL 414, or consent of instructor. LEC

EVRN 611  WATER QUALITY, LAND USE, AND WATERSHED ECOSYSTEMS  3 N
(NEW)
Water quality issues are integrated with land use planning and the development of watershed management strategies. Interrelationships among the hydrologic cycle, atmospheric deposition, nutrient transformations and pesticide use are examined in regards to stream, lake, and groundwater quality. Prerequisite: CHEM 125 or CHEM 130 and BIOL 414, or consent of instructor. LEC

CHANGE: PREREQUISITE
EVRN 656  ECOSYSTEM ECOLOGY  3 N
(OLD)
An introduction to the patterns and processes that affect terrestrial ecosystems. Emphasis is placed on understanding nutrient cycles (e.g., carbon nitrogen phosphorous), hydrologic cycles, and patterns of net primary productivity. The role of both natural and anthropogenic disturbances in structuring terrestrial ecosystems is examined in the context of global land-use patterns. Discussion of current research literature will be expected. (Same as BIOL 656.) Prerequisite: BIOL 414 and CHEM 184. LEC

EVRN 656  ECOSYSTEM ECOLOGY  3 N
(NEW)
An introduction to the patterns and processes that affect terrestrial ecosystems. Emphasis is placed on understanding nutrient cycles (e.g., carbon nitrogen phosphorous), hydrologic cycles, and patterns of net primary productivity. The role of both natural and anthropogenic disturbances in structuring terrestrial ecosystems is examined in the context of global land-use patterns. Discussion of current research literature will be expected. (Same as BIOL 656.) Prerequisite: BIOL 414 and CHEM 130. LEC

GEOGRAPHY

CHANGE: PREREQUISITE  COURSE IS CURRENTLY CROSSLISTED
GEOG 335  INTRODUCTION TO SOIL GEOGRAPHY  4 N
(OLD)
This course focuses on the properties and processes of soils as they occur in their environment. The student is introduced to the nature of soil as it functions as a body; genesis of soils; properties of soil solids, especially colloids; soil chemical composition, properties, and reactions; interaction between solid, liquid, and gaseous components in soils; plant-soil-water relationships; biological interactions with soil; classification of soils; and the distribution of soils on the landscape. Not open to students who have taken GEOG 535. Prerequisite: GEOG 104 or GEOL 101 or consent of instructor; BIOL 100 and CHEM 184 or CHEM 185 recommended.

GEOG 335  INTRODUCTION TO SOIL GEOGRAPHY  4 N
(NEW)
This course focuses on the properties and processes of soils as they occur in their environment. The student is introduced to the nature of soil as it functions as a body; genesis of soils; properties of soil solids, especially colloids; soil chemical composition, properties, and reactions; interaction between solid, liquid, and gaseous components in soils; plant-soil-water relationships; biological interactions with soil; classification of soils; and the distribution of soils on the landscape. Not open to students
who have taken GEOG 535. Prerequisite: GEOG 104 or GEOL 101 or consent of instructor; BIOL 100 and CHEM 130 or CHEM 190 recommended.

CHANGE: CREDIT COURSE IS CURRENTLY CROSSLISTED

GEOG 535 SOIL GEOGRAPHY 5 N
(OLD) A broad study of the principles and properties of soils and their distribution on the landscape. Topics covered include: pedology, clay mineralogy, soil physics, soil chemistry, management of soils, soil biology, taxonomy, and soil geomorphology. Laboratory section and a field project are required. Not open to students who have taken GEOG 335. Prerequisite: GEOG 104 or GEOL 101 or consent of the instructor; BIOL 104 and CHEM 130 or 190 recommended.

GEOG 535 SOIL GEOGRAPHY 4 N
(NEW) A broad study of the principles and properties of soils and their distribution on the landscape. Topics covered include: pedology, clay mineralogy, soil physics, soil chemistry, management of soils, soil biology, taxonomy, and soil geomorphology. Laboratory section and a field project are required. Not open to students who have taken GEOG 335. Prerequisite: GEOG 104 or GEOL 101 or consent of the instructor; BIOL 104 and CHEM 130 or 190 recommended.

CHANGE: PREREQUISITE COURSE IS CURRENTLY CROSSLISTED

GEOG 538 ENVIRONMENTAL SOIL PHYSICS AND CHEMISTRY 4 N
(OLD) This course examines the physical and chemical properties of soils and methods of evaluation. Physical topics include the movement of water, heat, gases, and solutes through soil. Chemistry topics include solid and solution speciation, mineral solubility, ion exchange, and oxidation-reduction reactions in soils. Prerequisite: GEOG 335 or GEOG 535; CHEM 188/189, MATH 121, and PHSX 114, or consent of instructor.

GEOG 538 ENVIRONMENTAL SOIL PHYSICS AND CHEMISTRY 4 N
(NEW) This course examines the physical and chemical properties of soils and methods of evaluation. Physical topics include the movement of water, heat, gases, and solutes through soil. Chemistry topics include solid and solution speciation, mineral solubility, ion exchange, and oxidation-reduction reactions in soils. Prerequisite: GEOG 335 or GEOG 535; CHEM 135/195, MATH 121, and PHSX 114, or consent of instructor.

GEOLOGY

CHANGE: PREREQUISITE

GEOL 311 MINERALOGY AND STRUCTURE OF THE EARTH 3 H
(OLD) Basic identification and properties of rocks and minerals in the context of whole-earth structure and evolution. Includes basic chemical equilibria for rock and mineral systems and their bearing on processes involved with formation and evolution of Earth's crust, mantle, and core. Two lectures and one lab per week. Prerequisite: GEOL 101, CHEM 125 or CHEM 184, and eligibility for MATH 121 or MATH 115. LEC

GEOL 311 MINERALOGY AND STRUCTURE OF THE EARTH 3 H
(NEW) Basic identification and properties of rocks and minerals in the context of whole-earth structure and evolution. Includes basic chemical equilibria for rock and mineral systems and their bearing on processes involved with formation and evolution of Earth's crust, mantle, and core. Two lectures and one lab per week. Prerequisite: GEOL 101, CHEM 125 or CHEM 130, and eligibility for MATH 121 or MATH 115. LEC

CHANGE: PREREQUISITE

GEOL 312 MINERAL STRUCTURES AND EQUILIBRIA LABORATORY 1 H
(OLD) A laboratory to accompany GEOL 311. Presents more rigorous analysis of the structures, compositions, and chemical equilibria governing the formation and stability of common rock-forming mineral systems. Prerequisite: GEOL 311 (may be taken concurrently), CHEM 125 or CHEM 184, and eligibility for MATH 121 or MATH 115. LAB

GEOL 312 MINERAL STRUCTURES AND EQUILIBRIA LABORATORY 1 H
(NEW) A laboratory to accompany GEOL 311. Presents more rigorous analysis of the structures, compositions, and chemical equilibria governing the formation and stability of common rock-
forming mineral systems. Prerequisite: GEOL 311 (may be taken concurrently), CHEM 125 or CHEM 130, and eligibility for MATH 121 or MATH 115. LAB

B. Degree Requirements for Approval

1. Change to Existing Geology Major

   **Current Requirements:** BIOL 660 Lake Ecology
   
   Option B: Environmental Geology
   
   College Requirements and Geology Core Courses
   
   Geology Electives
   
   A minimum of 15 hours in geology or related courses. Several possible tracks of upper-level course work are given below. Students may choose from these or select other courses in consultation with an adviser.
   
   Track 1: Water, Geology, and the Environment

   - GEOL 302 Oceanography (3)
   - GEOL 351 Environmental Geology (3)
   - GEOL 391 Special Studies in Geology: Water Resources (3)
   - GEOL 541 Geomorphology (4)
   - GEOL 552 Introduction to Hydrogeology (3)
   - ATMO 515 Energy and Water Balance (3)
   - CE 477 Introduction to Environmental Engineering and Science (3)
   - BIOL 660 Lake Ecology, BIOL 661 Ecology of Rivers and Lakes (3)

   **Proposed**
   
   BA Geology degree, Option B: Environmental Geology, Track 1: Water, Geology and the Environment Change the requirement from BIOL 660 (course deleted) to BIOL 661 (course added)

   **Justification**
   
   The changes are in response to a curricular change proposal by EEB. Offering of BIOL 660 will be discontinued. BIOL 661 course title and content will be revised to include material from BIOL 660.

2. **New Non-Western Culture Designation for EALC 121**

   Course Number and Title: EALC 121 Introduction to Contemporary China
   
   Course description: An overview of contemporary Chinese culture and society since the economic reforms and opening up launched in 1978, through the study of changes in politics, the economy, society, culture and everyday life in China. The course is taught in English. NO prior knowledge of the Chinese language is required. NW

3. Change to Existing B.S. Chemistry all options

   Chemistry Major Changes

   **Requirements for the B.S. Degree (Current)**

   The significant differences between the B.S. and B.A. lie in the distribution requirements and the required subjects. This outline lists all required courses and some suggested electives. The program satisfies College requirements as well as certification standards of the American Chemical Society.
Chemistry Courses 50 hours

CHEM 184 (or CHEM 185) Foundations of Chemistry I (5)
CHEM 188 (or CHEM 189) Foundations of Chemistry II (5)
CHEM 295 Seminar I (0.5)
CHEM 516 Analytical Chemistry (3)
CHEM 517 Analytical Chemistry Laboratory (2)
CHEM 624 (or CHEM 628) Organic Chemistry I (3)
CHEM 625 Organic Chemistry I Laboratory (2)
CHEM 626 (or CHEM 630) Organic Chemistry II (3)
CHEM 627 Organic Chemistry II Laboratory (2)
CHEM 635 Instrumental Methods of Analysis (2)
CHEM 636 Instrumental Methods of Analysis Laboratory (2)
CHEM 646 Physical Chemistry I (3)
CHEM 647 Physical Chemistry I Laboratory (2)
CHEM 648 Physical Chemistry II (4)
CHEM 649 Physical Chemistry II Laboratory (2)
CHEM 667 Systematic Inorganic Chemistry (3)
CHEM 668 Advanced Inorganic Laboratory (2)
CHEM 695 Seminar II (0.5)

Plus one or more of the following courses:

CHEM 698 (or CHEM 699) Undergraduate Research Problems or
700-level course (4)

Mathematics, Physics and Biochemistry 26-27 hours

MATH 121 Calculus I (5)
MATH 122 Calculus II (5)
MATH 220 Applied Differential Equations (3) or
MATH 320 Elementary Differential Equations (or honors equivalent) (3)
MATH 290 Elementary Linear Algebra (2)
PHSX 211 General Physics I (4)
PHSX 212 General Physics II (4)
BIOL 600 Introductory Biochemistry, Lectures (4) or
BIOL 636 Biochemistry I (3)

Other Requirements 27-29 hours

*Additional language or skill (A course in French, German, Russian, Japanese, Chinese, Spanish, or EECS 138, CHEM 711, MATH 526 or MATH 320 or another language or skill course) (3-5).

English (ENGL 101 and 102) (6)

Western civilization (6)

Humanities (6)

Social Sciences (6)

Additional credit hours of general electives are needed to meet the minimum total hours required for graduation. An overall average grade of C must be earned in all upper-level KU courses in chemistry.
Native speakers must demonstrate ability to translate selected material into acceptable scientific English. Although a second language is no longer required for the B.S. degree, both the chemistry department and the ACS strongly recommend study of a second language.

Requirements for the B.S. Degree (New)

The significant differences between the B.S. and B.A. lie in the distribution requirements and the required subjects. This outline lists all required courses and some suggested electives. The program satisfies College requirements as well as certification standards of the American Chemical Society.

Chemistry Courses 50 hours

- CHEM 170 Chemistry for the Chemical Sciences I (5) or
- CHEM 130 General Chemistry I (5) or
- CHEM 190 Foundations of Chemistry I, Honors (5)
- CHEM 175 Chemistry for the Chemical Sciences II (5) or
- CHEM 135 General Chemistry II (5) or
- CHEM 195 Foundations of Chemistry II, Honors (5)
- CHEM 295 Seminar I (0.5)
- CHEM 230 Organic Chemistry I (3) or
- CHEM 280 Organic Chemistry I, Honors (3)
- CHEM 231 Organic Chemistry I Laboratory (2)
- CHEM 235 Organic Chemistry II (3) or
- CHEM 285 Organic Chemistry II, Honors (3)
- CHEM 236 Organic Chemistry II Laboratory (2)
- CHEM 530 Physical Chemistry I (3)
- CHEM 531 Physical Chemistry I Laboratory (2)
- CHEM 535 Physical Chemistry II (4)
- CHEM 536 Physical Chemistry II Laboratory (2)
- CHEM 620 Analytical Chemistry (3)
- CHEM 621 Analytical Chemistry Laboratory (2)
- CHEM 635 Instrumental Methods of Analysis (2)
- CHEM 636 Instrumental Methods of Analysis Laboratory (2)
- CHEM 660 Systematic Inorganic Chemistry (3)
- CHEM 661 Advanced Inorganic Laboratory (2)
- CHEM 695 Seminar II (0.5)

Plus one or more of the following courses:

- CHEM 698 (or CHEM 699) Undergraduate Research Problems or 700-level course (4)

Mathematics, Physics and Biochemistry 26-27 hours

- MATH 121 Calculus I (5)
- MATH 122 Calculus II (5)
- MATH 220 Applied Differential Equations (3) or
- MATH 320 Elementary Differential Equations (or honors equivalent) (3)
- MATH 290 Elementary Linear Algebra (2)
- PHSX 211 General Physics I (4)
- PHSX 212 General Physics II (4)
- BIOL 600 Introductory Biochemistry, Lectures (4) or
- BIOL 636 Biochemistry I (3)
Other Requirements 24 hours

English (ENGL 101 and 102) (6)
Western civilization (6)
Humanities (6)
Social Sciences (6)

Additional credit hours of general electives are needed to meet the minimum total hours required for graduation. An overall average grade of C must be earned in all upper-level KU courses in chemistry.

Justification:

1) Renumbering of the courses so that all courses have higher numbers than their prerequisites and to make the numbering system more systematic.
2) Change in titles for courses formerly numbered CHEM 184 and 188 (new numbers CHEM 130 and 135, respectively)
3) Addition of a proposed new two-semester freshman chemistry sequence, CHEM 170 and 175.
4) The “foreign language or other research skill” requirement for BS Chemistry majors is a vestige of an earlier requirement for foreign language study that existed in our department. Historically, many important chemistry-related journals and books were written in German, Russian, Chinese, French, and Japanese. Accessing the chemistry literature on the inclusive scale needed for successful research required the reading of foreign language publications. Today, international scientific organizations recognize English as the common language for all formal communications. Manuscripts that are not authored in English are usually published in English concurrently, or they are published as an English translation very soon after their initial appearance. Research skills addressed by the “foreign language or other research skill” requirement were, historically, taught in curriculum-driven courses. Because the skills needed for modern chemistry research are best learned in the context of participation in faculty-directed research, the KU Chemistry faculty voted unanimously that the “foreign language or other research skill” requirement be eliminated.

B.S. Major: Biological Chemistry Option (Current)

Chemistry Courses  50 hours

CHEM 184 (or CHEM 185) Foundations of Chemistry I (5)
CHEM 188 (or CHEM 189) Foundations of Chemistry II (5)
CHEM 295 Seminar I (0.5)
CHEM 516 Analytical Chemistry (3)
CHEM 517 Analytical Chemistry Laboratory (2)
CHEM 624 (or CHEM 628) Organic Chemistry I (3)
CHEM 625 Organic Chemistry I Laboratory (2)
CHEM 626 (or CHEM 630) Organic Chemistry II (3)
CHEM 627 Organic Chemistry II Laboratory (2)
CHEM 635 Instrumental Methods of Analysis (2)
CHEM 636 Instrumental Methods of Analysis Laboratory (2)
CHEM 646 Physical Chemistry I (3)
CHEM 647 Physical Chemistry I Laboratory (2)
CHEM 648 Physical Chemistry II (4)
CHEM 649 Physical Chemistry II Laboratory (2)
CHEM 667 Systematic Inorganic Chemistry (3)
CHEM 668 Advanced Inorganic Laboratory (2)
CHEM 695 Seminar II (0.5)

Plus one or more of the following courses:

CHEM 698 (or CHEM 699) Undergraduate Research Problems or 700-level course (4)

**Biology and Biochemistry Courses** 12 hours

BIOL 150 Principles of Molecular and Cellular Biology (or honors equivalent) (4)
BIOL 636 Biochemistry I (3)
BIOL 637 Introductory Biochemistry Laboratory (2)
BIOL 638 Biochemistry II (3)

**Biology Option Group** 3 hours

Choose one of the following:

BIOL 350 Principles of Genetics (3)
BIOL 400 Fundamentals of Microbiology (3)
BIOL 416 Cell Structure and Function (3) (BIOL 350 is a prerequisite)

**Mathematics and Physics** 23 hours

MATH 121 Calculus I (5)
MATH 122 Calculus II (5)
MATH 220 Applied Differential Equations (3) or MATH 320 Elementary Differential Equations (3)
MATH 290 Elementary Linear Algebra (2)
PHSX 211 General Physics I (4)
PHSX 212 General Physics II (4)

**Other Requirements** 21 hours

English (ENGL 101 and ENGL 102) (6)
Western civilization (6)
Humanities (3)
Social Sciences (6)

**B.S. Major: Biological Chemistry Option (New)**

**Chemistry Courses**  50 hours

CHEM 170 Chemistry for the Chemical Sciences I (5) or
CHEM 130 General Chemistry I (5) or
CHEM 190 Foundations of Chemistry I, Honors (5)
CHEM 175 Chemistry for the Chemical Sciences II (5) or
CHEM 135 General Chemistry II (5) or
CHEM 195 Foundations of Chemistry II, Honors (5)
CHEM 295 Seminar I (0.5)
CHEM 230 Organic Chemistry I (3) or
CHEM 280 Organic Chemistry I, Honors (3)
CHEM 231 Organic Chemistry I Laboratory (2)
CHEM 235 Organic Chemistry II (3) or
CHEM 285 Organic Chemistry II, Honors (3)
CHEM 236 Organic Chemistry II Laboratory (2)
CHEM 530 Physical Chemistry I (3)
CHEM 531 Physical Chemistry I Laboratory (2)
CHEM 535 Physical Chemistry II (4)
CHEM 536 Physical Chemistry II Laboratory (2)
CHEM 620 Analytical Chemistry (3)
CHEM 621 Analytical Chemistry Laboratory (2)
CHEM 635 Instrumental Methods of Analysis (2)
CHEM 636 Instrumental Methods of Analysis Laboratory (2)
CHEM 660 Systematic Inorganic Chemistry (3)
CHEM 661 Advanced Inorganic Laboratory (2)
CHEM 695 Seminar II (0.5)

Plus one or more of the following courses:

CHEM 698 (or CHEM 699) Undergraduate Research Problems or 700-level course (4)

**Biology and Biochemistry Courses** 12 hours

BIOL 150 Principles of Molecular and Cellular Biology (or honors equivalent) (4)
BIOL 636 Biochemistry I (3)
BIOL 637 Introductory Biochemistry Laboratory (2)
BIOL 638 Biochemistry II (3)

**Biology Option Group** 3 hours

Choose one of the following:

BIOL 350 Principles of Genetics (3)
BIOL 400 Fundamentals of Microbiology (3)
BIOL 416 Cell Structure and Function (3) (BIOL 350 is a prerequisite)

**Mathematics and Physics** 23 hours

MATH 121 Calculus I (5)
MATH 122 Calculus II (5)
MATH 220 Applied Differential Equations (3) or
MATH 320 Elementary Differential Equations (3)
MATH 290 Elementary Linear Algebra (2)
PHSX 211 General Physics I (4)
PHSX 212 General Physics II (4)

**Other Requirements** 21 hours

English (ENGL 101 and ENGL 102) (6)
Western civilization (6)
Humanities (3)
Social Sciences (6)

Additional credit hours of general electives are needed to meet the minimum total hours required for graduation. An overall average grade of C must be earned in all upper-level KU courses in chemistry.

**Justification:**

1) Renumbering of the courses so that all courses have higher numbers than their prerequisites and to make the numbering system more systematic.
2) Change in titles for courses formerly numbered CHEM 184 and 188 (new numbers CHEM 130 and 135)

3) Addition of a proposed new two semester freshman chemistry sequence, CHEM 170 and 175.

B.S. Major: Chemical Physics Option (Current)

This option allows students to focus on the theoretical basis of chemistry. Students are prepared for graduate programs or employment. The curriculum substitutes 4 physics or mathematics courses for 4 courses in the standard program.

Chemistry Courses 50 hours [This is incorrect; include change in justification]

CHEM 184 (or CHEM 185) Foundations of Chemistry I (5)
CHEM 188 (or CHEM 189) Foundations of Chemistry II (5)
CHEM 295 Seminar I (0.5)
CHEM 516 Analytical Chemistry (3)
CHEM 517 Analytical Chemistry Laboratory (2)
CHEM 624 (or CHEM 628) Organic Chemistry I (3)
CHEM 625 Organic Chemistry I Laboratory (2)
CHEM 626 (or CHEM 630) Organic Chemistry II (3)
CHEM 627 Organic Chemistry II Laboratory (2)
CHEM 635 Instrumental Methods of Analysis (2)
CHEM 636 Instrumental Methods of Analysis Laboratory (2)
CHEM 646 Physical Chemistry I (3)
CHEM 647 Physical Chemistry I Laboratory (2)
CHEM 648 Physical Chemistry II (4)
CHEM 649 Physical Chemistry II Laboratory (2)
CHEM 667 Systematic Inorganic Chemistry (3)
CHEM 668 Advanced Inorganic Laboratory (2)
CHEM 695 Seminar II (0.5)

Mathematics, Physics and Biology 29-30 hours

MATH 121 Calculus I (5)
MATH 122 Calculus II (5)
MATH 220 Applied Differential Equations (3) or
MATH 320 Elementary Linear Algebra (2)
MATH 223 Vector Calculus (3)
MATH 290 Elementary Linear Algebra (2)
PHSX 211 General Physics I (4)
PHSX 212 General Physics II (4)
BIOL 600 Introductory Biochemistry, Lectures (4) or
BIOL 636 Biochemistry I (3)

Chemical Physics Option Group I 6-7 hours

Choose 2 courses:
PHSX 313 General Physics III and PHSX 316 Intermediate Physics Laboratory I (4)
PHSX 518 Mathematical Physics (3)
PHSX 615 Numerical and Computational Methods in Physics (3)
PHSX 521 Mechanics I (3)
PHSX 623 Physics of Fluids (3)
PHSX 655 Optics (3)
PHSX 681 Concepts in Solids (3)
Chemical Physics Option Group II  6 hours

Choose 2 courses:

PHSX 531 Electricity and Magnetism (3)
PHSX 621 Mechanics II (3)
MATH 646 Complex Variable and Applications (3)
MATH 647 Applied Partial Differential Equations (3)
CHEM 698 (or CHEM 699) Undergraduate Research (3)
(To count toward the chemical physics option, the research must have a clear chemical physics focus.)

Other Requirements 21 hours

English (ENGL 101 and ENGL 102) (6)
Western civilization (6)
Humanities (3)
Social Sciences (6)

B.S. Major: Chemical Physics Option (New)

This option allows students to focus on the theoretical basis of chemistry. Students are prepared for graduate programs or employment. The curriculum substitutes 4 physics or mathematics courses for 4 courses in the standard program.

Chemistry Courses  46 hours

CHEM 170 Chemistry for the Chemical Sciences I (5) or
CHEM 130 General Chemistry I (5) or
CHEM 190 Foundations of Chemistry I, Honors (5)
CHEM 175 Chemistry for the Chemical Sciences II (5) or
CHEM 135 General Chemistry II (5) or
CHEM 195 Foundations of Chemistry II, Honors (5)
CHEM 295 Seminar I (0.5)
CHEM 230 Organic Chemistry I (3) or
CHEM 280 Organic Chemistry I, Honors (3)
CHEM 231 Organic Chemistry I Laboratory (2)
CHEM 235 Organic Chemistry II (3) or
CHEM 285 Organic Chemistry II, Honors (3)
CHEM 236 Organic Chemistry II Laboratory (2)
CHEM 530 Physical Chemistry I (3)
CHEM 531 Physical Chemistry I Laboratory (2)
CHEM 535 Physical Chemistry II (4)
CHEM 536 Physical Chemistry II Laboratory (2)
CHEM 620 Analytical Chemistry (3)
CHEM 621 Analytical Chemistry Laboratory (2)
CHEM 635 Instrumental Methods of Analysis (2)
CHEM 636 Instrumental Methods of Analysis Laboratory (2)
CHEM 660 Systematic Inorganic Chemistry (3)
CHEM 661 Advanced Inorganic Laboratory (2)
CHEM 695 Seminar II (0.5)

Mathematics, Physics and Biology 29-30 hours

MATH 121 Calculus I (5)
MATH 122 Calculus II (5)
MATH 220 Applied Differential Equations (3) or
MATH 320 Elementary Linear Algebra (2)
MATH 223 Vector Calculus (3)
MATH 290 Elementary Linear Algebra (2)
PHSX 211 General Physics I (4)
PHSX 212 General Physics II (4)
BIOL 600 Introductory Biochemistry, Lectures (4) or
BIOL 636 Biochemistry I (3)

**Chemical Physics Option Group I** 6-7 hours

Choose 2 courses:
PHSX 313 General Physics III and PHSX 316 Intermediate Physics Laboratory I (4)
PHSX 518 Mathematical Physics (3)
PHSX 615 Numerical and Computational Methods in Physics (3)
PHSX 521 Mechanics I (3)
PHSX 623 Physics of Fluids (3)
PHSX 655 Optics (3)
PHSX 681 Concepts in Solids (3)

**Chemical Physics Option Group II** 6 hours

Choose 2 courses:
PHSX 531 Electricity and Magnetism (3)
PHSX 621 Mechanics II (3)
MATH 646 Complex Variable and Applications (3)
MATH 647 Applied Partial Differential Equations (3)
CHEM 698 (or CHEM 699) Undergraduate Research (3)
(To count toward the chemical physics option, the research must have a clear chemical physics focus.)

**Other Requirements** 21 hours

English (ENGL 101 and ENGL 102) (6)
Western civilization (6)
Humanities (3)
Social Sciences (6)

**Justification:**

1) Renumbering of the courses so that all courses have higher numbers than their prerequisites and to make the numbering system more systematic.
2) Change in titles for courses formerly numbered CHEM 184 and 188 (new numbers CHEM 130 and 135)
3) Addition of a proposed new two semester freshman chemistry sequence, CHEM 170 and 175.
4) Correction to the total number of chemistry course hours required for this option (actual number of hours is 46).

**B.S. Major: Environmental Chemistry Option (Current)**

This option allows students to focus on environmental issues and to understand how chemistry may be applied to environmental problems. Students are prepared for graduate programs or employment. The curriculum substitutes four environmentally related courses.
for four courses in the standard B.S. program. The program satisfies College requirements as well as American Chemical Society standards.

**Chemistry Courses** 44 hours

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>CHEM 184</td>
<td>(or CHEM 185) Foundations of Chemistry I (5)</td>
<td></td>
</tr>
<tr>
<td>CHEM 188</td>
<td>(or CHEM 189) Foundations of Chemistry II (5)</td>
<td></td>
</tr>
<tr>
<td>CHEM 295</td>
<td>Seminar I (0.5)</td>
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</tr>
<tr>
<td>CHEM 516</td>
<td>Analytical Chemistry (3)</td>
<td></td>
</tr>
<tr>
<td>CHEM 517</td>
<td>Analytical Chemistry Laboratory (2)</td>
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</tr>
<tr>
<td>CHEM 624</td>
<td>(or CHEM 628) Organic Chemistry I (3)</td>
<td></td>
</tr>
<tr>
<td>CHEM 625</td>
<td>Organic Chemistry I Laboratory (2)</td>
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<td>CHEM 626</td>
<td>(or CHEM 630) Organic Chemistry II (3)</td>
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<td>Organic Chemistry II Laboratory (2)</td>
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<tr>
<td>CHEM 635</td>
<td>Instrumental Methods of Analysis (2)</td>
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<td>CHEM 646</td>
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<td>CHEM 667</td>
<td>Systematic Inorganic Chemistry (3)</td>
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<tr>
<td>CHEM 695</td>
<td>Seminar II (0.5)</td>
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**Mathematics and Physics** 23 hours

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<tr>
<td>MATH 122</td>
<td>Calculus II (5)</td>
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<tr>
<td>MATH 220</td>
<td>Applied Differential Equations (3) or</td>
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<tr>
<td>MATH 320</td>
<td>Elementary Linear Algebra (2)</td>
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<tr>
<td>PHSX 211</td>
<td>General Physics I (4)</td>
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</tr>
<tr>
<td>PHSX 212</td>
<td>General Physics II (4)</td>
<td></td>
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</tbody>
</table>

Environmental Chemistry Option Group I 6-8 hours

Choose 2 courses:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>BIOL 100</td>
<td>Principles of Biology (3)</td>
</tr>
<tr>
<td><strong>BIOL 150</strong></td>
<td>Principles of Molecular and Cellular Biology (4)</td>
</tr>
<tr>
<td>EVRN 148</td>
<td>Scientific Principles of Environmental Studies (4)</td>
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<tr>
<td>GEOG 304</td>
<td>Environmental Conservation (3)</td>
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<tr>
<td>GEOL 351</td>
<td>Environmental Geology (3)</td>
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<tr>
<td>BIOL 400</td>
<td>Fundamentals of Microbiology (3)</td>
</tr>
<tr>
<td>BIOL 414</td>
<td>Principles of Ecology (3)</td>
</tr>
<tr>
<td>BIOL 600</td>
<td>Introductory Biochemistry, Lectures (4)</td>
</tr>
<tr>
<td>ATMO 105</td>
<td>Introductory Meteorology (5)</td>
</tr>
</tbody>
</table>

**Environmental Chemistry Option Group II** 6-7 hours

Choose 2 courses:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>BIOL 660</td>
<td>Lake Ecology (with or without BIOL 662) Aquatic Ecology Laboratory (3-5)</td>
</tr>
<tr>
<td>CE 477</td>
<td>Introduction to Environmental Engineering and Science (3)</td>
</tr>
<tr>
<td>GEOL 552</td>
<td>Introduction to Hydrogeology (3)</td>
</tr>
<tr>
<td>ATMO 525</td>
<td>Air Pollution Meteorology (3)</td>
</tr>
<tr>
<td>EVRN 611</td>
<td>Water Quality, Land Use, and Watershed Ecosystems (3)</td>
</tr>
</tbody>
</table>
CHEM 698 Undergraduate Research Problems (3) (CHEM 698 is strongly recommended for all students in this option. To count toward this option, the research must have a clear environmental focus and may not be taken until completion of CHEM 516 and CHEM 517 and consultation with a chemistry major adviser.)

**Note:** All 4 courses chosen from Groups I and II may not be in the same department or division.

**Other Requirements** 26 hours

*Additional language or skill (A course in French, German, Russian, Japanese, Chinese, Spanish, or EECS 138, CHEM 711, MATH 526 or MATH 320, or another language or skill course)
English (ENGL 101 and ENGL 102) (6)
Western civilization (6)
Humanities (6)
Social Sciences (6)

Additional credit hours of general electives are needed to meet the minimum total hours required for graduation. An overall average grade of C must be earned in all upper-level KU courses in chemistry.

*Native speakers must demonstrate ability to translate selected material into acceptable scientific English. Although a second language is no longer required for the B.S. degree, both the chemistry department and the ACS strongly recommend study of a second language.

**B.S. Major: Environmental Chemistry Option (New)**

This option allows students to focus on environmental issues and to understand how chemistry may be applied to environmental problems. Students are prepared for graduate programs or employment. The curriculum substitutes four environmentally related courses for four courses in the standard B.S. program. The program satisfies College requirements as well as American Chemical Society standards.

**Chemistry Courses**  44 hours

CHEM 170 Chemistry for the Chemical Sciences I (5) or
CHEM 130 General Chemistry I (5) or
CHEM 190 Foundations of Chemistry I, Honors (5)
CHEM 175 Chemistry for the Chemical Sciences II (5) or
CHEM 135 General Chemistry II (5) or
CHEM 195 Foundations of Chemistry II, Honors (5)
CHEM 295 Seminar I (0.5)
CHEM 230 Organic Chemistry I (3) or
CHEM 280 Organic Chemistry I, Honors (3)
CHEM 231 Organic Chemistry I Laboratory (2)
CHEM 235 Organic Chemistry II (3) or
CHEM 285 Organic Chemistry II, Honors (3)
CHEM 236 Organic Chemistry II Laboratory (2)
CHEM 530 Physical Chemistry I (3)
CHEM 531 Physical Chemistry I Laboratory (2)
CHEM 535 Physical Chemistry II (4)
CHEM 536 Physical Chemistry II Laboratory (2)
CHEM 620 Analytical Chemistry (3)
CHEM 621 Analytical Chemistry Laboratory (2)
CHEM 635 Instrumental Methods of Analysis (2)
CHEM 636 Instrumental Methods of Analysis Laboratory (2)
CHEM 660 Systematic Inorganic Chemistry (3)
CHEM 695 Seminar II (0.5)

Mathematics and Physics 23 hours

MATH 121 Calculus I (5)
MATH 122 Calculus II (5)
MATH 220 Applied Differential Equations (3) or
    MATH 320 Elementary Linear Algebra (2)
PHSX 211 General Physics I (4)
PHSX 212 General Physics II (4)

Environmental Chemistry Option Group I 6-8 hours

Choose 2 courses:

BIOL 100 Principles of Biology (3) or
BIOL 150 Principles of Molecular and Cellular Biology (4)
EVRN 148 Scientific Principles of Environmental Studies (3)
GEOG 304 Environmental Conservation (3)
GEOL 351 Environmental Geology (3)
BIOL 400 Fundamentals of Microbiology (3)
BIOL 414 Principles of Ecology (3)
BIOL 600 Introductory Biochemistry, Lectures (4)
ATMO 105 Introductory Meteorology (5)

Environmental Chemistry Option Group II 6-7 hours

Choose 2 courses:

BIOL 660 Lake Ecology (with or without BIOL 662) Aquatic Ecology Laboratory) (3-5)
CE 477 Introduction to Environmental Engineering and Science (3)
GEOL 552 Introduction to Hydrogeology (3)
ATMO 525 Air Pollution Meteorology (3)
EVRN 611 Water Quality, Land Use, and Watershed Ecosystems (3)
CHEM 698 Undergraduate Research Problems (3) (CHEM 698 is strongly recommended for all students in this option. To count toward this option, the research must have a clear environmental focus and may not be taken until completion of CHEM 620 and CHEM 621 and consultation with a chemistry major adviser.)
Note: All 4 courses chosen from Groups I and II may not be in the same department or division.

Other Requirements 24 hours

English (ENGL 101 and ENGL 102) (6)
Western civilization (6)
Humanities (6)
Social Sciences (6)

Additional credit hours of general electives are needed to meet the minimum total hours required for graduation. An overall average grade of C must be earned in all upper-level KU courses in chemistry.

Justification:

1) Renumbering of the courses so that all courses have higher numbers than their prerequisites and to make the numbering system more systematic.
2) Change in titles for courses formerly numbered CHEM 184 and 188 (new numbers CHEM 130 and 135)
3) Addition of a proposed new two semester freshman chemistry sequence, CHEM 170 and 175.
4) The “foreign language or other research skill” requirement for BS Chemistry majors is a vestige of an earlier requirement for foreign language study that existed in our department. Historically, many important chemistry-related journals and books were written in German, Russian, Chinese, French, and Japanese. Accessing the chemistry literature on the inclusive scale needed for successful research required the reading of foreign language publications. Today, international scientific organizations recognize English as the common language for all formal communications. Manuscripts that are not authored in English are usually published in English concurrently, or they are published as an English translation very soon after their initial appearance. Research skills addressed by the “foreign language or other research skill” requirement were, historically, taught in curriculum-driven courses. Because the skills needed for modern chemistry research are best learned in the context of participation in faculty-directed research, the KU Chemistry faculty voted unanimously that the “foreign language or other research skill” requirement be eliminated.

Requirements for the Chemistry Minor (Current)

Requirements for the Minor:
The minor allows students outside the department to obtain a strong, distributed background in the discipline. It is particularly useful for students anticipating careers in medicine, allied health, biological sciences, environmental sciences, chemical engineering, business, law, secondary education, or any career in which a basic understanding of the molecular sciences is helpful. A total of 23 credit hours is required. Students should see a chemistry department adviser early in the junior year. Some of the required courses are only offered once per year.

Required Courses (15 hours)
CHEM 184 (or CHEM 185) Foundations of Chemistry I (5)
CHEM 188 (or CHEM 189) Foundations of Chemistry II (5)
CHEM 622 Fundamentals of Organic Chemistry (3) or
CHEM 624 Organic Chemistry I (3) or
CHEM 628 Organic Chemistry I (3)
CHEM 625 Organic Chemistry I Laboratory (2)

Elective Group I (5 hours)
Choose 1 of the following:
CHEM 640 Biological Physical Chemistry (3) and
CHEM 641 Biological Physical Chemistry Laboratory (2) or
CHEM 646 Physical Chemistry I (3) and
CHEM 647 Physical Chemistry Laboratory I (2)
CHEM 516 Analytical Chemistry (3) and
CHEM 517 Analytical Chemistry Laboratory (2)

Elective Group II (3 hours)
Choose 1 of the following:
CHEM 640 Biological Physical Chemistry (3) or
CHEM 646 Physical Chemistry I (3)
CHEM 667 Systematic Inorganic Chemistry (3)

Requirements for the Chemistry Minor (New)
**Requirements for the Minor:**
The minor allows students outside the department to obtain a strong, distributed background in the discipline. It is particularly useful for students anticipating careers in medicine, allied health, biological sciences, environmental sciences, chemical engineering, business, law, secondary education, or any career in which a basic understanding of the molecular sciences is helpful. A total of 23 credit hours is required. Students should see a chemistry department adviser early in the junior year. Some of the required courses are only offered once per year.

**Required Courses (15 hours)**
CHEM 170 Chemistry for the Chemical Sciences I (5) or
CHEM 130 General Chemistry I (5) or
CHEM 190 Foundations of Chemistry I, Honors (5)
CHEM 175 Chemistry for the Chemical Sciences II (5) or
CHEM 135 General Chemistry II (5) or
CHEM 195 Foundations of Chemistry II, Honors (5)
CHEM 210 Fundamentals of Organic Chemistry (3) or
CHEM 230 Organic Chemistry I (3) or
CHEM 280 Organic Chemistry I (3)
CHEM 231 Organic Chemistry I Laboratory (2)

**Elective Group I (5 hours)**
Choose 1 of the following:
CHEM 510 Biological Physical Chemistry (3) and
CHEM 511 Biological Physical Chemistry Laboratory (2) or
CHEM 530 Physical Chemistry I (3) and
CHEM 531 Physical Chemistry Laboratory I (2)
CHEM 620 Analytical Chemistry (3) and
CHEM 621 Analytical Chemistry Laboratory (2)

**Elective Group II (3 hours)**
Choose 1 of the following:
CHEM 510 Biological Physical Chemistry (3) or
CHEM 530 Physical Chemistry I (3)
CHEM 660 Systematic Inorganic Chemistry (3)

4. **Change to Existing Chemistry Related Changes to other Majors and Minors**
CHEMISTRY RELATED DEGREE REQUIREMENT CHANGES
Requirements for the B.A. Major in Astronomy
In addition to general education requirements for B.A. degrees in the College, 39.5 hours of astronomy, physics, mathematics, and chemistry are required.

Foundational Physics, Mathematics, and Basic Science 23.5 hours
PHSX 150 Seminar in Physics, Astronomy, and Engineering Physics (0.5)
PHSX 211 (or PHSX 213) General Physics I (4) and
PHSX 212 (or PHSX 214) General Physics II (4)
MATH 121 Calculus I (5) and
MATH 122 Calculus II (5)
CHEM 130 Foundations of General Chemistry I (5)

Astronomy Requirements 16 hours
ASTR 196 Introductory Astronomy Laboratory (1) or
ASTR 596 Observational Astrophysics (1)
ASTR 391 Physical Astronomy, Honors (3)
ASTR 390 Undergraduate Problems (3)
ASTR 591 Stellar Astronomy (3)
ASTR 592 Galactic and Extragalactic Astronomy (3)
PHSX 693 Gravitation and Cosmology (3) or
ASTR 691 Astrophysics I (3) or
GEOL 572 Geophysics (3)

Requirements for the B.S. Degree in Astronomy

**Foundational Physics, Mathematics, and Basic Science 23.5 hours**
PHSX 150 Seminar in Physics, Astronomy, and Engineering Physics (0.5)
PHSX 211 (or PHSX 213) General Physics I (4) and
PHSX 212 (or PHSX 214) General Physics II (4)
MATH 121 Calculus I (5) and
MATH 122 Calculus II (5)
CHEM 184 Foundations of General Chemistry I (5)

**Astronomy Requirements 20 hours**
ASTR 391 Physical Astronomy, Honors (3)
ASTR 596 Observational Astrophysics (1)
ASTR 591 Stellar Astronomy (3)
ASTR 592 Galactic and Extragalactic Astronomy (3)
PHSX 693 Gravitation and Cosmology (3)
ASTR 691 Astrophysics I (3)
ASTR 692 Astrophysics II (3)
ASTR 503 Undergraduate Research (1)

**Physics Requirements 23 hours**
PHSX 313 General Physics III (3) and
PHSX 316 Intermediate Physics Laboratory I (1)
PHSX 511 Introductory Quantum Mechanics (3)
PHSX 521 Mechanics I (3)
PHSX 531 Electricity and Magnetism (3)
PHSX 536 Electronic Circuit Measurement and Design (4) or
PHSX 516 Physical Measurements (4)
PHSX 671 Thermal Physics (3)
Advanced physics elective (3) (any lecture or laboratory course numbered 500 or higher, including ASTR 795/PHSX 795 Space Plasma Physics and GEOL 572 Geophysics)

**Advanced Mathematics Requirements 11 hours**
MATH 223 Vector Calculus (3) and
MATH 290 Elementary Linear Algebra (2)
MATH 320 Elementary Differential Equations (3)
MATH elective (3) (This may be chosen from PHSX 518, PHSX 718, MATH 526, MATH 530, MATH 558, MATH 581, MATH 590, MATH 628, MATH 646, MATH 647, MATH 648, MATH 660, MATH 661, or any 700-level MATH lecture course except MATH 701 and MATH 715.)
Other Requirements

- English: satisfaction of the B.A. requirements. If requirements can be met in fewer than 9 hours, the remaining hours become free electives (ENGL 362 Foundations of Technical Writing is accepted as the third English course) (9)
- Humanities: 2 courses, including at least 1 principal course (6)
- Social sciences: 2 courses, including at least 1 principal course (6)
- Western civilization (6)
- EECS 138 Introduction to Computing: FORTRAN or C++ (3) or EECS 168 Programming I (4)
- Additional credit hours of free electives in courses outside the major are needed to complete the required 120 credit hours

Requirements for the B.S. Degree in Atmospheric Science

4 specialized options are available for students who plan professional careers in meteorology or atmospheric science. The general meteorology option satisfies all the traditional professional meteorology requirements for employment with the National Weather Service, airlines, or other agencies. The air pollution meteorology option meets the need for trained specialists. The hydrometeorology option may lead to a career as a meteorologist in one of the many water-related activities in private and governmental agencies. The news media forecasting option can lead to a career forecasting the weather on television or radio. The B.S. degree with any of these specialties also prepares students to begin graduate programs in meteorology or atmospheric science.

General Requirements for All Options 94-95 hours
ATMO 105 Introductory Meteorology (5)
ATMO 321/GEOG 321 Climate and Climate Change (3)
ATMO 505 Weather Forecasting (3)
ATMO 521/GEOG 521 Microclimatology (3)
ATMO 630 Synoptic Meteorology (3)
ATMO 640 Dynamic Meteorology (3)
ATMO 642 Remote Sensing (3)
ATMO 660 Advanced Dynamic Meteorology (3)
ATMO 680 Physical Meteorology (3)
ATMO 697 Seminar for Seniors (1)
CHEM 184 130 Foundations of General Chemistry I (5)
COMS 130 Speaker-Audience Communication (3) or COMS 150 Personal Communication (3) and COMS 330 Effective Business Communication (3)
EECS 138 Introduction to Computing: FORTRAN (3)
ENGL 101, ENGL 102, and any 200-level English course or ENGL 362 Foundations of Technical Writing (9)
EVRN 148 Scientific Principles of Environmental Studies (3)
MATH 581 Numerical Methods (3)
MATH 121, MATH 122, MATH 223, MATH 290, MATH 320 or MATH 220, MATH 526 Applied Mathematical Statistics I or DSCI 301 Statistics (21-22)
PHSX 211 General Physics I (4)
PHSX 212 General Physics II (4)
Humanities and social sciences (one course each) (6)
General Meteorology Option
ATMO 525 Air Pollution Meteorology (3)
ATMO 605 Operational Forecasting (2)
ATMO 650 Advanced Synoptic Meteorology (3)
Additional credit hours of general electives are needed to meet the minimum total hours required for graduation.

Air Pollution Meteorology Option
ATMO 525 Air Pollution Meteorology (3)
CHEM 188 135 Foundations of General Chemistry II (5)
CE 477 Introduction to Environmental Engineering and Science (3)
Additional credit hours of general electives are needed to meet the minimum total hours required for graduation.

Hydrometeorology Option
ATMO 525 Air Pollution Meteorology (3)
ATMO 605 Operational Forecasting (2)
CE 301 Statics and Dynamics (5)
CE 330 Fluid Mechanics (4)
CE 455 Hydrology (3)
Additional credit hours of general electives are needed to meet the minimum total hours required for graduation.

News Media Forecasting Option
ATMO 605 Operational Forecasting (2)
ATMO 650 Advanced Synoptic Meteorology (3)
JOUR 301 Research and Writing (3)
JOUR 415 Multimedia Reporting (3)
JOUR 512 Principles of Broadcasting, Cable, and New Technologies (3)
Additional credit hours of general electives are needed to meet the minimum total hours required for graduation.

Requirements for the B.A. Biochemistry

B.A. Biochemistry
General Science Requirements 35-39 hours

CHEM 184 Foundations of Chemistry I (5) CHEM 170 Chemistry for the Chemical Sciences I (or CHEM 190 Honors) (5)
CEHM 188 Foundations of Chemistry II (5) CHEM 175 Chemistry for the Chemical Sciences II (or CHEM 195 Honors) (5)
CHEM 624 230 Organic Chemistry I (or CHEM 280 Honors) (3)
CHEM 625 231 Organic Chemistry I Laboratory (2)
CHEM 626 235 Organic Chemistry II (or CHEM 285 Honors) (3)
CHEM 640 510 Biological Physical Chemistry (3)
*MATH 121 Calculus I (5) and *MATH 122 Calculus II (5) or MATH 115 Calculus I (3) and MATH 116 Calculus II (3)*Students who plan to attend graduate school should enroll in MATH 121 and MATH 122.
PHSX 211 General Physics I (4) and PHSX 212 General Physics II (4) or PHSX 114 College Physics I (4) and PHSX 115 College Physics II (4)
Requirements for the B.S. Biochemistry Degree

**B.S. Biochemistry**

General Science Requirements 45 hours

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<tr>
<th>Course</th>
<th>Title</th>
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<tbody>
<tr>
<td>CHEM 184</td>
<td>Foundations of Chemistry I (5)</td>
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<tr>
<td>CHEM 170</td>
<td>Chemistry for the Chemical Sciences I (5)</td>
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<td>CHEM 188</td>
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<td>CHEM 516</td>
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<td>CHEM 624</td>
<td>Organic Chemistry I (or CHEM 280 Honors)</td>
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<td>CHEM 640</td>
<td>Biological Physical Chemistry (3)</td>
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<td>MATH 121</td>
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<tr>
<td>PHSX 115</td>
<td>College Physics II (4)</td>
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Requirements for the B.A. Biology Major

**B.A. Biology**

General Science Requirements 28-29 hours

<table>
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<th>Title</th>
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<td>CHEM 130</td>
<td>General Chemistry I (or CHEM 190 Honors)</td>
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<td>CHEM 135</td>
<td>General Chemistry II (or CHEM 195 Honors)</td>
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<td>CHEM 622</td>
<td>Fundamentals of Organic Chemistry (3)</td>
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</tr>
<tr>
<td>CHEM 624</td>
<td>Organic Chemistry I (or CHEM 280 Honors)</td>
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<td>CHEM 625</td>
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<td>MATH 121</td>
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Requirements for the B.S. Biology Degree – all emphases

**B.S. Biology/Cell Biology**

General Science Requirements 31-32 hours

<table>
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<tr>
<th>Course</th>
<th>Title</th>
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<tr>
<td>CHEM 625</td>
<td>Organic Chemistry I Laboratory (2)</td>
<td></td>
</tr>
<tr>
<td>CHEM 626</td>
<td>Organic Chemistry II (or CHEM 285 Honors)</td>
<td>3</td>
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</tbody>
</table>
MATH 121 Calculus I (5) or MATH 115 Calculus I (3) and MATH 116 Calculus II (3)
PHSX 114 College Physics I (4) and PHSX 115 College Physics II (4) or PHSX 211 General Physics I (4) and PHSX 212 General Physics II (4)

B.S. Biology/Ecology & Evolutionary Biology
General Science Requirements 25-28 hours

CHEM 184 Foundations of Chemistry I (5) or CHEM 130 General Chemistry I (or CHEM 190 Honors) (5)
CHEM 188 Foundations of Chemistry II (5) or CHEM 135 General Chemistry II (or CHEM 195 Honors) (5)
CHEM 622 210 Fundamentals of Organic Chemistry (3) or CHEM 624 230 Organic Chemistry I (or CHEM 280 Honors) (3)
MATH 121 Calculus I (5) or MATH 115 Calculus I (3) and MATH 116 Calculus II (3)

PHSX 114 College Physics I (4) and PHSX 115 College Physics II (4) or PHSX 211 General Physics I (4) and PHSX 212 General Physics II (4)

B.S. Biology/Genetics
General Science Requirements 28-29 hours

CHEM 184 Foundations of Chemistry I (5) or CHEM 130 General Chemistry I (or CHEM 190 Honors) (5)
CHEM 188 Foundations of Chemistry II (5) or CHEM 135 General Chemistry II (or CHEM 195 Honors) (5)
CHEM 622 210 Fundamentals of Organic Chemistry (3) or CHEM 624 230 Organic Chemistry I (or CHEM 280 Honors) (3)
* CHEM 625 231 Organic Chemistry I Laboratory (2)* Students who plan to attend graduate school (particularly those interested in applying molecular techniques) or medical school should also enroll in CHEM 626 235 and CHEM 627 236.
MATH 121 Calculus I (5) or MATH 115 Calculus I (3) and MATH 116 Calculus II (3)

PHSX 114 College Physics I (4) and PHSX 115 College Physics II (4) or PHSX 211 General Physics I (4) and PHSX 212 General Physics II (4)

B.S. Biology/Neurobiology
General Science Requirements 31-32 hours

CHEM 184 Foundations of Chemistry I (5) or CHEM 130 General Chemistry I (or CHEM 190 Honors) (5)
CHEM 188 Foundations of Chemistry II (5) or CHEM 135 General Chemistry II (or CHEM 195 Honors) (5)
CHEM 624 230 Organic Chemistry I (or CHEM 280 Honors) (3)
CHEM 625 231 Organic Chemistry I Laboratory (2)
CHEM 626 235 Organic Chemistry II (or CHEM 285 Honors) (3)
MATH 121 Calculus I (5) or MATH 115 Calculus I (3) and MATH 116 Calculus II (3)

PHSX 114 College Physics I (4) and PHSX 115 College Physics II (4) or PHSX 211 General Physics I (4) and PHSX 212 General Physics II (4)

B.S. Biology/Organismal Biology
General Science Requirements 28-29 hours

CHEM 184 Foundations of Chemistry I (5) CHEM 130 General Chemistry I (or CHEM 190 Honors) (5)
CHEM 188 Foundations of Chemistry II (5) CHEM 135 General Chemistry II (or CHEM 195 Honors) (5)
CHEM 622 210 Fundamentals of Organic Chemistry (3) or CHEM 624 230 Organic Chemistry I (or CHEM 280 Honors) (3)
CHEM 625 231 Organic Chemistry I Laboratory (2)
MATH 121 Calculus I (5) or MATH 115 Calculus I (3) and MATH 116 Calculus II (3)
PHSX 114 College Physics I (4) and PHSX 115 College Physics II (4) or PHSX 211 General Physics I (4) and PHSX 212 General Physics II (4)

B.S. Biology/Teaching Biology

General Science Requirements 28-29 hours

CHEM 184 Foundations of Chemistry I (5) CHEM 130 General Chemistry I (or CHEM 190 Honors) (5)
CHEM 188 Foundations of Chemistry II (5) CHEM 135 General Chemistry II (or CHEM 195 Honors) (5)
CHEM 622 210 Fundamentals of Organic Chemistry (3) or CHEM 624 230 Organic Chemistry I (or CHEM 280 Honors) (3)
CHEM 625 231 Organic Chemistry I Laboratory (2)
MATH 121 Calculus I (5) or MATH 115 Calculus I (3) and MATH 116 Calculus II (3)
PHSX 114 College Physics I (4) and PHSX 115 College Physics II (4) or PHSX 211 General Physics I (4) and PHSX 212 General Physics II (4)

Requirements for the B.A. Human Biology Major

B.A. Human Biology, all five subplans

General Science Requirements 33 hours minimum

ANTH 304 Fundamentals of Physical Anthropology (3-4)
BIOL 150 (or BIOL 151 Honors) Principles of Molecular and Cellular Biology (4)
BIOL 152 (or BIOL 153 Honors) Principles of Organismal Biology (4)
MATH 115 Calculus I (3) and MATH 116 Calculus II (3) or MATH 121 Calculus I (5)
CHEM 184 Foundations of Chemistry I (5) CHEM 130 General Chemistry I (or CHEM 190 Honors) (5)
CHEM 188 Foundations of Chemistry II (5) CHEM 135 General Chemistry II (or CHEM 195 Honors) (5)
PHSX 114 College Physics I (4) or PHSX 211 General Physics I (4)

*Biol 570 Introduction to Biostatistics (3) or PSYC 210 Statistics in Psychological Research (3) or MATH 365 Elementary Statistics (3)

B.A. Human Biology/Anthropology

Anthropology Concentration 30 hours minimum
Organic Chemistry: CHEM 622 210 Fundamentals of Organic Chemistry (3) or CHEM 624 230 Organic Chemistry I (or CHEM 280 Honors) (3)
CHEM 625 231 Organic Chemistry I Laboratory (2)
Cell Biology: BIOL 416 Cell Structure and Function (3)
Genetics: BIOL 350 Principles of Genetics (3)
Seminar: BIOL 599 Senior Seminar: Human Biology (must be taken in senior year) (1)

B.A. Human Biology/Biology
Biology Concentration 31 hours minimum

Organic Chemistry: CHEM 622 210 Fundamentals of Organic Chemistry (3) or CHEM 624 230 Organic Chemistry I (or CHEM 280 Honors) (3)
CHEM 625 231 Organic Chemistry I Laboratory (2)
Physics: PHSX 115 College Physics II (4) or PHSX 211 General Physics II (4)
Genetics: BIOL 350 Principles of Genetics (3)
Seminar: BIOL 599 Senior Seminar: Human Biology (must be taken in senior year) (1)

B.A. Human Biology/Psychology
Psychology Concentration 30 hours minimum

Organic Chemistry: CHEM 622 210 Fundamentals of Organic Chemistry (3) or CHEM 624 230 Organic Chemistry I (or CHEM 280 Honors) (3)
CHEM 625 231 Organic Chemistry I Laboratory (2)
Genetics: BIOL 350 Principles of Genetics (3)
Research Methods: PSYC 200 Research Methods in Psychology (3)
Seminar: BIOL 599 Senior Seminar: Human Biology (must be taken in senior year) (1)

Requirements for the B.A. Microbiology Major

B.A. Microbiology
General Science Requirements 34-35 hours

BIOL 150 (or BIOL 151 Honors) Principles of Molecular and Cellular Biology (4)
BIOL 350 Principles of Genetics (3)
CHEM 184 Foundations of Chemistry I (5) CHEM 130 General Chemistry I (or CHEM 190 Honors) (5)
CHEM 188 Foundations of Chemistry II (5) CHEM 135 General Chemistry II (or CHEM 195 Honors) (5)
CHEM 622 210 Fundamentals of Organic Chemistry (3) or CHEM 624 230 Organic Chemistry I (or CHEM 280 Honors) (3)
CHEM 625 231 Organic Chemistry I Laboratory (2)
MATH 115 Calculus I (3) and MATH 116 Calculus II (3) or MATH 121 Calculus I (5)
PHSX 114 College Physics I (4) and PHSX 115 College Physics II (4) or PHSX 211 General Physics I (4) and PHSX 212 General Physics II (4)

Requirements for the B.S. Microbiology Degree

B.S. Microbiology
General Science Requirements 49-50 hours

BIOL 150 (or BIOL 151 Honors) Principles of Molecular and Cellular Biology (4)
BIOL 350 Principles of Genetics (3)  CHEM 184 Foundations of Chemistry I (5)  CHEM 130 General Chemistry I (or CHEM 190 Honors) (5)  CHEM 188 Foundations of Chemistry II (5)  CHEM 135 General Chemistry II (or CHEM 195 Honors) (5)  CHEM 624 230 Organic Chemistry I (or CHEM 280 Honors) (3)  CHEM 625 231 Organic Chemistry I Laboratory (2)  CHEM 626 235 Organic Chemistry II (or CHEM 285 Honors) (3)  CHEM 627 236 Organic Chemistry II Laboratory (2)  

PHSX 114 College Physics I (4) and PHSX 115 College Physics II (4) or PHSX 211 General Physics I (4) and PHSX 212 General Physics II (4)  
MATH 121 Calculus I (5) or MATH 115 Calculus I (3) and MATH 116 Calculus II (3)  
BIOL 570 Introduction to Biostatistics (3) or MATH 365 Elementary Statistics (3) or PSYC 210 Statistics in Psychological Research (3)  
BIOL 636 Biochemistry I (3)  
BIOL 638 Biochemistry II (3) 

Requirements for the B.S. Molecular Biosciences Degree 

B.S. Molecular Biosciences  
General Science Requirements 36-37 hours minimum  

CHEM 184 Foundations of Chemistry I (5)  CHEM 130 General Chemistry I (or CHEM 190 Honors) (5)  CHEM 188 Foundations of Chemistry II (5)  CHEM 135 General Chemistry II (or CHEM 195 Honors) (5)  CHEM 624 230 Organic Chemistry I (or CHEM 280 Honors) (3)  CHEM 625 231 Organic Chemistry I Laboratory (2)  CHEM 626 235 Organic Chemistry II (or CHEM 285 Honors) (3)  CHEM 627 236 Organic Chemistry II Laboratory (2)  

PHSX 114 College Physics I (4) and PHSX 115 College Physics II (4) or PHSX 211 General Physics I (4) and PHSX 212 General Physics II (4)  
MATH 121 Calculus I (5) or MATH 115 Calculus I (3) and MATH 116 Calculus II (3)  
BIOL 570 Introduction to Biostatistics (3) or MATH 365 Elementary Statistics (3) or PSYC 210 Statistics in Psychological Research (3)  

Requirements for the B.S. Degree Environmental Studies 

B.S. Major Courses  
64 to 70 hours are required.  

Introduction to Science and Culture 6-10 hours  

- **EVRN 140** Global Environment I: The Discovery of Environmental Change (3) and **EVRN 141** Global Environment I: Interdisciplinary Laboratory (2) or
• EVRN 148/GEOG 148 Scientific Principles of Environmental Studies (3) or
  EVRN 149/GEOG 149 Scientific Principles of Environmental Studies Honors (3)
• And choose one of the following:
  EVRN 142 Global Environment II: The Ecology of Human Civilization (3) and
  EVRN 143 Global Environment II: Interdisciplinary Laboratory (2) or
  EVRN 103/HIST 103 Environment and History or
  EVRN 347/HIST 347 Environmental History of North America (3) or
  EVRN 150/GEOG 150 Environment, Culture, and Society (3)

Mathematics 5-6 hours
• MATH 115 Calculus (3) and MATH 116 Calculus II (3) or
  MATH 121 Calculus I (5)

Statistics 3-4 hours
Choose one of the following:
• MATH 365 Elementary Statistics (3)
• GEOG 316 Methods of Analyzing Geographical Data (4)
• BIOL 570 Introduction to Biostatistics (3)

Core Courses 12 hours
• EVRN 320 Environmental Policy Analysis (3)
• EVRN 332 Environmental Law (3)
• EVRN 460 Field Ecology (3)
• EVRN 615 Capstone Project (3)

Biology and Ecology 11 hours
• BIOL 150 Principles of Molecular and Cellular Biology (4) or
  BIOL 151 Principles of Molecular And Cellular Biology, Honors (4)
• BIOL 152 Principles of Organismal Biology (4) or
  BIOL 153 Principles of Organismal Biology, Honors (4)
• BIOL 414 Principles of Ecology (3)

Chemistry 10 hours
• CHEM 184 130 Foundations of General Chemistry I (5) or
  CHEM 185 135 Foundations of General Chemistry I, Honors (5)
• CHEM 188 190 Foundations of Chemistry II (5) or
  CHEM 189 195 Foundations of Chemistry II, Honors (5)

Additional Laboratory Science 5 hours
• GEOG 104 Principles of Physical Geography (3) and
  GEOG 105 Introductory Laboratory in Physical Geography (2)
• GEOL 101 Introduction to Geology (3) and
  GEOL 103 Geological Fundamentals Laboratory (2)
• GEOL 102 Introduction to Geology, Honors (3) and
  GEOL 103 Geological Fundamentals Laboratory (2)
• CHEM 622 Fundamentals of Organic Chemistry (3) and
  CHEM 625 Organic Chemistry I Laboratory (2)
Electives 12 hours minimum  
A minimum of 12 hours is required at the 300-level and above, with at least one course with the EVRN prefix.

Requirements for the B.S. Degree Geography  
B.S. students must select 1 of the options below (physical geography or geographical information and analysis). A total of 120 credit hours is required, of which 45 must be junior/senior hours, 30 must be KU residence hours, no more than 64 may be community college transfer hours, no more than 6 may be music organization hours, and no more than 4 may be physical education hours. An overall grade-point average of 2.0 is required, with an average of 2.0 in geography junior/senior courses.

Physical Geography Option  

General Requirements  
- English (ENGL 101 or exemption) (0-3)
- ENGL 102 (or ENGL 105 or exemption) (0-3)
- 200/300-level English course or above (e.g., ENGL 362 recommended) (3)
- COMS 130 (COMS 230, PHIL 148, PHIL 310, or exemption) (0-3)
- History or philosophy of science (3)  
  (Choose 1 of the following or consult undergraduate committee for approval of alternatives: HIST 103, HIST 136, HIST 305, HIST 306, HIST 311, HIST 347, HIST 360, HIST 407, PHIL 365, PHIL 370, PHIL 375, PHIL 380, PHIL 620, PHIL 622, GEOG 357)
- 2 principal courses in the humanities (6)
- 2 principal courses in the social sciences (6)

Preparation for the Major  
- MATH 121 Calculus I (5) and MATH 122 Calculus II (recommended) (5) or
  MATH 115 Calculus I (3) and MATH 116 Calculus II (3)
- PHSX 211 General Physics I and PHSX 212 General Physics II (8) (recommended) or
  PHSX 114 College Physics I and PHSX 115 College Physics II (6-8)
- BIOL 150 Principles of Molecular and Cellular Biology (4)
- BIOL 152 Principles of Organismal Biology (4)
- CHEM 130 Foundations of General Chemistry I (5)
- CHEM 135 Foundations of General Chemistry II (5)
- EECS 128 Foundations of Information Technology: _____ or equivalent (3)

Geography Requirements  

Overview Courses  
- GEOG 104 Principles of Physical Geography (3) or
  GEOG 107 Principles of Physical Geography, Honors (3)
- GEOG 105 Introductory Laboratory in Physical Geography (2)
- GEOG 100 (or GEOG 101) World Regional Geography (3) or
  GEOG 102 (or GEOG 103) Principles of Human Geography (3)
Foundation Courses

1. Physical: Choose 3 of the following: (9-10)
   - GEOG 304 Environmental Conservation
   - GEOG 321 Climate and Climate Change
   - GEOG 331 Regional Geomorphology of the United States
   - GEOG 338 Introduction to River Systems
   - GEOG 335 Introduction to Soil Geography or GEOG 535 Soil Geography

2. Techniques: The following are required: (12)
   - GEOG 316 Methods of Analyzing Geographical Data
   - GEOG 358 Principles of Geographic Information Systems
   - GEOG 526 Remote Sensing of Environment I

3. Field Experience: Choose 1 of the following: (3-4)
   - EVRN 460 Field Ecology
   - GEOG 433 Biogeography Field and Laboratory Techniques
   - GEOG 714 Field Experience

Elective Courses

- 6 additional hours from the physical geography course list (300 level or above) (6)
- 6 additional hours of geography (any group, 300 level or above) (6)
- 6 additional hours in an allied field (e.g., ATMO, BIOL, EVRN, or GEOL) approved by geography adviser (6)

Requirements for the B.A. Geology Major

Requirements for the B.A. Major

In addition to College requirements, these courses are required:

- MATH 115 Calculus I (3) or
  MATH 121 Calculus I (5)
- CHEM 184 Foundations of Chemistry I 130 General Chemistry I (5) or
  CHEM 125 College Chemistry (5)
- PHSX 111 Introductory Physics (3) or
  PHSX 114 College Physics I (4) or
  PHSX 211 General Physics I (4)
- BIOL 100 Principles of Biology (3)
- BIOL 102 Principles of Biology Laboratory (1)
- EECS 128 Foundations of Information Technology: _____ (3) or
  EECS 138 Introduction to Computing: _____ (3)

Geology Core 24 hours

- GEOL 101 Introduction to Geology (3) and
  GEOL 103 Geology Fundamentals Laboratory (2)
- GEOL 311 Mineralogy and Structure of the Earth (3)
- GEOL 331 Sedimentology and Surface Processes (4)
- GEOL 360 Field Investigation (2)
- GEOL 521 Paleontology (3)
- GEOL 560 Introductory Field Geology (3)
- **GEOL 562 Structural Geology (4)**

**Requirements for the B.S. Geology Degree – all emphases**

**General Geology Option**

- Satisfaction of the College English requirement (6-9)
- COMS 130 Speaker-Audience Communication (3) or COMS 150 Personal Communication (3) (or exemption)
- 2 courses in the humanities (6-10)
- 2 courses in the social sciences (an introductory course in economics is recommended) (6-8)
- MATH 121 Calculus I (5) and MATH 122 Calculus II (5) (recommended) or MATH 115 Calculus I (3) and MATH 116 Calculus II (3) plus MATH 122 Calculus II (5)
- PHSX 211 General Physics I (4) and PHSX 212 General Physics II (4)
- CHEM 184 Foundations of Chemistry I 130 General Chemistry I (5) and CHEM 188 Foundations of Chemistry II 135 General Chemistry II (5)
- BIOL 150 Principles of Molecular and Cellular Biology (4) and BIOL 152 Principles of Organismal Biology (4)
- EECS 128 Foundations of Information Technology: _____ (3) or EECS 138 Introduction to Computing: _____ (3) or C&PE 121 Introduction to Computers in Engineering (3)

**Geology 49 hours**

- GEOL 101 Introduction to Geology (3) and GEOL 103 Geology Fundamentals Laboratory (2)
- GEOL 311 Mineralogy and Structure of the Earth (3)
- GEOL 312 Mineral Structures and Equilibria Laboratory (1)
- GEOL 331 Sedimentology and Surface Processes (4)
- GEOL 360 Field Investigation (2)
- GEOL 512 Igneous and Metamorphic Petrology (3)
- GEOL 513 Petrology Laboratory (1)
- GEOL 521 Paleontology (3)
- GEOL 523 Paleontology Laboratory (1)
- GEOL 532 Stratigraphy (4)
- GEOL 560 Introductory Field Geology (3)
- GEOL 561 Field Geology (3)
- GEOL 562 Structural Geology (4)
- GEOL 572 Geophysics (3) or GEOL 573 Geodynamics and Plate Tectonics (3)
- At least 9 hours in geology courses numbered 500 or above (9)
  This can include 3 hours of GEOL 399, GEOL 105, GEOL 304, or GEOL 121 can also count if taken before the student has completed 60 hours. Electives may include an upper-division course in statistics (MATH 365 or BIOL 570).

**Engineering Geology Option**

- ENGL 101, ENGL 102, and ENGL 362 (9)
- COMS 130 Speaker-Audience Communication (3) or
  COMS 150 Personal Communication (3) (or exemption)
- 2 courses in the humanities (6-10)
- ECON 104 Introductory Economics (4)
- 1 additional course in the social sciences (3)
- MATH 121, MATH 122, MATH 220, and MATH 290 (15)
- CHEM 184 Foundations of Chemistry I 130 General Chemistry I (5) and
  CHEM 188 Foundations of Chemistry II 135 General Chemistry II (5)
- PHSX 211 General Physics I (4) and
  PHSX 212 General Physics II (4)
- CE 201 Statics (2)
- CE 300 Dynamics (3)
- CE 311 Strength of Materials (3)
- CE 330 Fluid Mechanics (4)
- CE 455 Hydrology (3)
- CE 487 Soil Mechanics (4)
- EECS 128 Foundations of Information Technology: _____ (3) or
  C&PE 121 Introduction to Computers in Engineering (3) or
  EECS 138 Introduction to Computing: _____ (3)

Geology 45-51 hours
- GEOL 101 Introduction to Geology (3) and
  GEOL 103 Geology Fundamentals Laboratory (2) or
  GEOL 105 History of the Earth (3)
- GEOL 311 Mineralogy and Structure of the Earth (3)
- GEOL 312 Mineral Structures and Equilibria Laboratory (1)
- GEOL 331 Sedimentology and Surface Processes (4)
- GEOL 351 Environmental Geology (3)
- GEOL 360 Field Investigation (2)
- GEOL 512 Igneous and Metamorphic Petrology (3)
- GEOL 513 Petrology Laboratory (1)
- GEOL 541 Geomorphology (4)
- GEOL 560 Introductory Field Geology (3)
- GEOL 561 Field Geology (3)
- GEOL 562 Structural Geology (4)
- GEOL 572 Geophysics (3) or
  GEOL 573 Geodynamics and Plate Tectonics (3)
- 3 additional geology or civil engineering courses, at least 2 of which must be from the following: (8-12)
  GEOL 521 Paleontology (3)
  GEOL 532 Stratigraphy (4)
  GEOL 535 Petroleum and Subsurface Geology (4)
  GEOL 715 Geochemistry (3)
  GEOL 751 Physical and Transport Hydrogeology (4)
  CE 770 Concepts of Environmental Chemistry (2) and
  CE 771 Environmental Chemical Analysis (1)
Electives may include an upper-division course in statistics (MATH 365 or BIOL 570).

Note: Total credit hours may exceed the university's minimum requirement for graduation.
Environmental Geology Option

- Satisfaction of the College English requirement (6-9)
- COMS 130 Speaker-Audience Communication (3) or COMS 150 Personal Communication (3) (or exemption)
- 2 courses in the humanities (6-10)
- 2 courses in the social sciences (an introductory course in economics is recommended) (6-8)
- MATH 121 Calculus I (5) and MATH 122 Calculus II (5) (recommended) or MATH 115 Calculus I (3) and MATH 116 Calculus II (3) plus MATH 122 Calculus II (5)
- PHSX 211 General Physics I (4) and PHSX 212 General Physics II (4) (recommended) or PHSX 114 College Physics I (4) and PHSX 115 College Physics II (4)
- CHEM 184 Foundations of Chemistry I and CHEM 188 Foundations of Chemistry II (or exemption)
- BIOL 150 Principles of Molecular and Cellular Biology (4) and BIOL 152 Principles of Organismal Biology (4)
- EECS 128 Foundations of Information Technology: _____ (3) or EECS 138 Introduction to Computing: _____ (3) or C&PE 121 Introduction to Computers in Engineering (3)

Geology 50 hours

- GEOL 101 Introduction to Geology (3) and GEOL 103 Geology Fundamentals Laboratory (2)
- GEOL 311 Mineralogy and Structure of the Earth (3)
- GEOL 351 Environmental Geology (3)
- GEOL 360 Field Investigation (2)
- GEOL 521 Paleontology (3)
- GEOL 532 Stratigraphy (4)
- GEOL 541 Geomorphology (4)
- GEOL 552 Introduction to Hydrogeology (3)
- GEOL 560 Introductory Field Geology (3)
- GEOL 562 Structural Geology (4)
- GEOL 572 Geophysics (3)
- Additional courses to total at least 9 hours numbered 500 or above or other courses approved by adviser. Recommended: (9)
  - GEOL 391 Special Studies in Geology: Water Resources (3)
  - GEOL 535 Petroleum and Subsurface Geology (4)
  - GEOL 715 Geochemistry (3)
  - GEOL 751 Physical and Transport Hydrogeology (4)
  - CE 770 Concepts of Environmental Chemistry (2) and CE 771 Environmental Chemical Analysis (1)
  - GEOG 535 Soil Geography (5)
  - GEOG 558 Intermediate Geographical Information Systems (4)
  - GEOL 753 Chemical and Microbial Hydrogeology (4)
  - BIOL 400 Fundamentals of Microbiology (3)
  - C&PE 517 Reservoir Engineering I (4)

Environmental Hydrogeology Track
Besides the general program above, a specialized track in hydrogeology satisfies degree requirements. In addition to College, supporting science, and geology courses, the environmental hydrogeology track requires the following mathematics and civil engineering/physics courses:

- **MATH 220** Applied Differential Equations (3) **and**
  **MATH 290** Elementary Linear Algebra (2)
- **CE 330** Fluid Mechanics (4) **or**
  **PHSX 623** Physics of Fluids (3)

**Technical Electives (9 hours).** These normally are chosen from courses numbered 500 or above in geology, physics, mathematics, chemistry, engineering or computer science. Courses numbered below 500 must be approved by a geology adviser.

**Geophysics Option**

**College English and Principal Course Requirements 21 hours**

- **ENGL 101, ENGL 102**, and a third course as specified by the College of Liberal Arts and Sciences (9)
- Courses in humanities and social sciences (12)
  (At least 3 hours must be taken in each area. View the principal course list. An introductory course in economics is recommended.)

**Chemistry, Mathematics, Computer Science, Engineering 28-31 hours**

- **EECS 138** Introduction to Computing: _____ (3) **or**
  demonstrate equivalent programming skills (0-3)
- **CHEM 184** Foundations of Chemistry I **and**
  **CHEM 188** Foundations of Chemistry II **and**
  **CHEM 130** General Chemistry I (5) **and**
  **CHEM 135** General Chemistry II (5)
- **MATH 121** Calculus I (5) **and**
  **MATH 122** Calculus II (5)
- **MATH 223** Vector Calculus (3) **and**
  **MATH 290** Elementary Linear Algebra (2)
- **MATH 320** Elementary Differential Equations (3)

**Physics 17 hours**

- **PHSX 211** General Physics I (4) **and**
  **PHSX 212** General Physics II (4)
- **PHSX 313** General Physics III (3)
- **PHSX 521** Mechanics I (3)
- **PHSX 531** Electricity and Magnetism (3)

**Geology 33 hours**

- **GEOL 101** Introduction to Geology (3) **and**
  **GEOL 103** Geology Fundamentals Laboratory (2)
- **GEOL 311** Mineralogy and Structure of the Earth (3)
- **GEOL 331** Sedimentology and Surface Processes (4)
- **GEOL 360** Field Investigation (2)
- **GEOL 512** Igneous and Metamorphic Petrology (3)
- **GEOL 560** Introductory Field Geology (3)
- **GEOL 562** Structural Geology (4)
- GEOL 572 Geophysics (3) or
  GEOL 573 Geodynamics and Plate Tectonics (3)
- 2 of these 4 courses in addition to geology courses above: (6)
  GEOL 572 Geophysics (3)
  GEOL 573 Geodynamics and Plate Tectonics (3)
  GEOL 575 Seismic Exploration (3)
  GEOL 577 Environmental Geophysics (3) (3)

**Technical Electives** (9 hours). These normally are chosen from courses numbered 500 or above in geology, physics, mathematics, chemistry, engineering, or computer science. Courses numbered below 500 must be approved by a geophysics adviser.

**Electives.** Additional credit hours of general electives are needed to meet the minimum total hours required for graduation.

**Graduation Requirements.** Students must earn a grade-point average of 2.0 in both physics and geology courses.

**Earth and Space Science Licensure Option**

This program fulfills the requirements for a Bachelor of Science degree in geology. The program also meets course requirements necessary to gain state licensure eligibility in earth and space science to become a secondary teacher in Kansas, but completion of the program does not guarantee the student’s licensure. This list is a guideline. Contact the geology department for further information about meeting degree and additional licensure requirements. You may also contact the UKanTeach Office for information about similar tracks resulting in eligibility for licensure in this and other science and mathematics fields.

**General Requirements 21 hours**

These courses must be taken on a letter-grade basis.

- *English:* ENGL 101 Composition (3) and ENGL 102 Critical Reading and Writing (3) (or equivalent)
- *Communication/Logic:* COMS 130 Speaker-Audience Communication (3) or COMS 150 Personal Communication (3) (or exemption/examination)
- *Humanities:* 1 principal course and HIST 136 or HIST 137 (or equivalent approved by geology department) (6)
- *Social Science:* 2 courses, preferably from the principal course list (6)

**Major/General Science Requirements 84 hours**

A minimum grade of C is required in all courses counted toward the major.

- *Mathematics:*
  MATH 121 Calculus I (5) and MATH 122 Calculus II (5) or
  MATH 115 Calculus I (3) and MATH 116 Calculus II (3) and MATH 122 Calculus II (5)
- *Physics:*
  PHSX 211 General Physics I (4) and
  PHSX 212 General Physics II (4)
• **Chemistry:**
  CHEM 184 130 (or CHEM 185 190) Foundations of General Chemistry I (5) and
  CHEM 188 135 (or CHEM 189 195) Foundations of General Chemistry II (5)

• **Biology:**
  BIOL 150 (or BIOL 151 Honors) Principles of Molecular and Cellular Biology (4) and
  BIOL 152 (or BIOL 153 Honors) Principles of Organismal Biology (4)

• **Geology Core Requirements** (32 hours):
  GEOL 101 Introduction to Geology (3) and
  GEOL 103 Geology Fundamentals Laboratory (2)
  • GEOL 311 Mineralogy and Structure of the Earth (3)
  • GEOL 331 Sedimentology and Surface Processes (4)
  • GEOL 360 Field investigation (2)
  • GEOL 521 Paleontology (3) and
    GEOL 523 Paleontology Laboratory (1)
  • GEOL 532 Stratigraphy (4)
  • GEOL 552 Introduction to Hydrogeology (3)
  • GEOL 560 Introductory Field Geology (3)
  • GEOL 562 Structural Geology (4)

• **Space Science Core Requirements** (9 hours):
  ATMO 105 Introductory Meteorology (5)
  ASTR 191 Contemporary Astronomy (3)
  ASTR 196 Introductory Astronomy Laboratory (1)

• **Earth and Space Electives:** 4 hours in a geology course numbered 300 or above (4) or
  4 hours in astronomy courses numbered 300 or above. This can include 3 hours of ASTR
  390 or GEOL 399, GEOL 105, GEOL 304, or GEOL 121 also can count if taken before the
  student has completed 60 hours (4)

• **Research Methods:** CHEM 598 Research Methods (3)
  (or equivalent course approved by geology in major field of study)

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**Professional Development Course Work Requirements 21 hours**
A minimum grade of C is required in all courses.

• **Liberal Arts and Sciences:**
  LA&S 290 Approaches to Teaching Science and Mathematics I (1) and
  LA&S 291 Approaches to Teaching Science and Mathematics II (1)

• **Curriculum and Teaching** (19 hours):
  C&T 448 Reading and Writing across the Curriculum (3) and
  16 hours of courses approved by UKanTeach in curriculum and teaching. These should
  include courses such as Classroom Interactions (3), Knowing and Learning (3), Project
  Based Instruction (3), Student Teaching (6), and Special Topics Seminar (1)

**Requirements for the B.S. Degree Mathematics**

First- and Second-Year Preparation 18 hours

• MATH 121 Calculus I (5) or
  MATH 141 Calculus I, Honors (5)

• MATH 122 Calculus II (5) or
  MATH 142 Calculus II, Honors (5)
- **MATH 223** Vector Calculus (3) or
  MATH 243 Vector Calculus, Honors (3)
- **MATH 290** Elementary Linear Algebra (2) or
  MATH 291 Elementary Linear Algebra, Honors (2)
- **MATH 320** Elementary Differential Equations (3) or
  MATH 220 Applied Differential Equations (3)

**Core Requirements 12-13 hours**
- *Linear Algebra*: MATH 590 Linear Algebra (3) or
  MATH 790 Linear Algebra II (3)
- *Analysis*: MATH 500 Intermediate Analysis (3) or
  MATH 765 Mathematical Analysis I (3)
- *Algebra*: MATH 558 Introductory Modern Algebra (3) or
  MATH 791 Modern Algebra (3)
- *Statistics*: MATH 526 Applied Mathematical Statistics I (3) or
  MATH 628 Mathematical Theory of Statistics (3) or
  MATH 728 Statistical Theory (3) or DSCI 301 Statistics (4)

**Mathematics Concentration/Sequence Requirements 6-12 hours**
- One 2-course sequence from List A and a second 2-course sequence from either List A or List B

**Electives 0-6 hours**
- Up to 2 additional 3-credit-hour courses to complete a total of 24 credit hours of mathematics courses numbered MATH 450 and above. Students who satisfy the core statistics requirement with DSCI 301 must choose an additional 3-credit-hour elective.

**Applied Concentration 8 hours**
- 3 courses, totaling at least 8 credit hours, that make significant use of mathematics. At least 2 courses must be in the same area. Courses from List C have been approved for this requirement. Other upper-division courses making significant use of mathematics can be used for the applied concentration with the approval of a mathematics department adviser.

**Note:** Many of these courses have prerequisites that do not count toward the mathematics major.

**Minimum Major Requirements 42 hours**
Applied Concentration 8 hours

**General Education Requirements 49-49 hours**
- *English, Argument and Reason, and Western Civilization (18)* *(These are the same as the requirements for the B.A. degree.)*
- *Computer Science*: EECS 138 (3) or EECS 168 (4)
- *Natural Science*: 1 course with laboratory (4-5 hours) and one additional course (3-5 hours) in biological science (NB), earth science (NE), or physical science (NP) (7-10)
- *Humanities and Foreign Language*: 4 courses in humanities and foreign language, at least two (6 hours) of which must be in humanities (designated H). Students are encouraged to complete at least two courses in a foreign language (12)
- *Social Sciences*: 2 courses designated S (6)
List A Sequences

- MATH 627 Probability (3) and MATH 628 Mathematical Theory of Statistics (3)
- MATH 660 Geometry I (3) and MATH 661 Geometry II (3)
- MATH 765 Mathematical Analysis I (3) and MATH 766 Mathematical Analysis II (3)
- MATH 781 Numerical Analysis I (3) and MATH 782 Numerical Analysis II (3)
- MATH 790 Linear Algebra II (3) and MATH 791 Modern Algebra (3)

List B Sequences

- MATH 500 Intermediate Analysis (3) and MATH 646 Complex Variable and Applications (3)
- MATH 526 Applied Mathematical Statistics I (3) and MATH 605 Applied Regression Analysis (3)
- MATH 526 Applied Mathematical Statistics I (3) and MATH 611 Time Series Analysis (3)
- MATH 530 Mathematical Models I (3) and MATH 531 Mathematical Models II (3)
- MATH 540 Elementary Number Theory (3) and MATH 558 Introductory Modern Algebra (3)
- MATH 558 Introductory Modern Algebra (3) and MATH 601 Algebraic Coding Theory (3)
- MATH 581 Numerical Methods (3) and MATH 591 Applied Numerical Linear Algebra (3)
- MATH 590 Linear Algebra (3) and MATH 790 Linear Algebra II (3)
- MATH 646 Complex Variable and Applications (3) and MATH 647 Applied Partial Differential Equations (3)
- MATH 647 Applied Partial Differential Equations (3) and MATH 648 Calculus of Variations and Integral Equations (3)
- MATH 724 Combinatorial Mathematics (3) and MATH 725 Graph Theory (3)

List C Applied Concentration Courses

- Statistics: MATH 605, MATH 611, MATH 624, ECON 817, ECON 818
- Management Science and Operations Management: SCM 310, DSCI 410
- Finance: FIN 310, FIN 410, FIN 415, FIN 420, FIN 425, MATH 630
- Economics: ECON 526, ECON 590, ECON 700, ECON 701, ECON 715, ECON 716
- Biology: BIOL 350, BIOL 412, BINF 701, BINF 702, BIOL 743, BIOL 747
- Physics and Astronomy: PHSX 313, PHSX 521, PHSX 531, ASTR 591, ASTR 592, PHSX 621, PHSX 631, PHSX 655, PHSX 671, ASTR 691, PHSX 741
- Chemistry: CHEM 516, CHEM 646, CHEM 648, CHEM 530, CHEM 535, CHEM 620
- Bioinformatics: BINF 701, BINF 702
- Chemical and Petroleum Engineering: C&PE 211, C&PE 511, C&PE 521, C&PE 523
- Civil Engineering: CE 201, CE 300, CE 301, CE 310, CE 311, CE 461, CE 704
- Electrical Engineering and Computer Science: EECS 211, EECS 220, EECS 360, EECS 420, EECS 444, EECS 510, EECS 560, EECS 562, EECS 638, EECS 649, EECS 660, EECS 662, EECS 672, EECS 718, EECS 730, EECS 744
- Mechanical Engineering: ME 201, ME 311, ME 312, ME 321, ME 508, ME 520, ME 612, ME 682, ME 740

Note: Some courses satisfying the sequence requirements are taught infrequently. More advanced courses can be substituted for lower level courses in many cases. Consult the mathematics department for expected course offerings and substitutions. Courses used to satisfy the core requirements can also be used to complete List A and List B sequences. However, courses used for the Applied Concentration requirement cannot also be counted toward the 24 credit hours of advanced mathematics courses for the B.S. degree.
Requirements for the B.A. Major in Physics

Foundational Physics and Mathematics 1805 hours

- PHSX 150 Seminar in Physics, Astronomy, and Engineering Physics (0.5)
- PHSX 211 (or PHSX 213) General Physics I (4)
- PHSX 212 (or PHSX 214) General Physics II (4)
- MATH 121 Calculus I (5) and
  MATH 122 Calculus II (5)

CHEM 484 130 is recommended. Some courses require MATH 223 and MATH 290 and
MATH 220 or MATH 320 as prerequisites. Other requirements follow the general education
requirements for B.A. degrees in the College of Liberal Arts and Sciences.

Advanced Physics Courses 20 hours

- PHSX 313 General Physics III (3) and
  PHSX 316 Intermediate Physics Laboratory I (1)
- PHSX 511 Introductory Quantum Mechanics (3)
- PHSX 521 Mechanics I (3)
- PHSX 531 Electricity and Magnetism (3)
- PHSX 536 Electronic Circuit Measurement and Design (4)
- Advanced physics elective (any lecture or laboratory course numbered 500 or higher) (3)

Concentration in Computational Physics

Requirements include 31.5 hours in physics:

- PHSX 150 Seminar in Physics, Astronomy, and Engineering Physics (0.5)
- PHSX 211 (or PHSX 213) General Physics I (4)
- PHSX 212 (or PHSX 214) General Physics II (4)
- PHSX 313 General Physics III (3) and
  PHSX 316 Intermediate Physics Laboratory (1)
- PHSX 521 Mechanics I (3)
- PHSX 531 Electricity and Magnetism (3)
- PHSX 536 Electronic Circuit Measurement and Design (4)
- PHSX 500 (or PHSX 501) Special Problems (6)
- PHSX 615 Numerical and Computational Methods in Physics (3)

Also required are 8 hours of computer science (EECS 168, EECS 268), MATH 290 and either
MATH 220 or MATH 320, CHEM 484 130 (5 hours), PHIL 310 (3 hours), ECON 142 or
ECON 144 (3 hours), and BIOL 100 (3 hours). CHEM 484 130, PHIL 310, ECON 142 or
ECON 144, and BIOL 100 should be taken to fulfill B.A. general education requirements.

Requirements for the B.S. Degree in Physics

2 different options are available for the physics B.S. curriculum. The pre-professional emphasis
offers a rigorous curriculum suitable for students planning on graduate study in physics or a
closely related field; the interdisciplinary option provides more flexibility for students interested
in developing some expertise in an allied science discipline.
General Requirements

- EECS 138 Introduction to Computing: FORTRAN or C++ (3) or EECS 168 Programming I (4)
- \textit{English}: Satisfaction of B.A. requirements. If requirements can be satisfied in fewer than 9 hours, the remaining hours become free electives. (ENGL 362 Foundations of Technical Writing is accepted as the third English course.) (9)
- Western civilization (6)
- \textit{Humanities}: 2 courses including at least one principal course (6)
- \textit{Social sciences}: 2 courses including at least one principal course (6)

Additional credit hours of general electives are needed to meet the minimum total hours required for graduation. Approximately 5 free elective hours must be taken at the junior/senior level to fulfill the requirement of 45 junior/senior hours.

Foundational Physics and Mathematics 23.5 hours

- PHSX 150 Seminar in Physics, Astronomy, and Engineering Physics (0.5)
- PHSX 211 or PHSX 213 General Physics I (4)
- PHSX 212 or PHSX 214 General Physics II (4)
- MATH 121 Calculus I (5) \textbf{and} MATH 122 Calculus II (5)
- CHEM 184 Foundations of General Chemistry I (5)

Advanced Mathematics 11 hours

- MATH 223 Vector Calculus (3) \textbf{and} MATH 290 Elementary Linear Algebra (2)
- MATH 320 Elementary Differential Equations (3)
- MATH elective (3) (This may be chosen from PHSX 518, PHSX 718, MATH 526, MATH 530, MATH 558, MATH 581, MATH 590, MATH 628, MATH 646, MATH 647, MATH 648, MATH 660, MATH 661, or any 700-level MATH lecture course except MATH 701 and MATH 715.)

Advanced Physics Core for Both B.S. Emphases 24 hours

- PHSX 313 General Physics III (3) \textbf{and} PHSX 316 Intermediate Physics Laboratory I (1)
- PHSX 511 Introductory Quantum Mechanics (3)
- PHSX 516 Physical Measurements (4) \textbf{or} PHSX 536 Electronic Circuit Measurement and Design (4)
- PHSX 521 Mechanics I (3)
- PHSX 531 Electricity and Magnetism (3)
- PHSX 671 Thermal Physics (3)
- PHSX 503 Undergraduate Research (1) \textbf{or} PHSX 501 Honors Research (1)
- PHSX elective (3) (any PHSX lecture or laboratory course numbered 500 or higher and not part of the other specific requirements for the major)

Preprofessional Emphasis

Students also take 13 credit hours in physics as follows:

- PHSX 621 Mechanics II (3)
- **PHSX 631** Electromagnetic Theory (3)
- **PHSX 711** Quantum Mechanics (3)
- **PHSX 516** Physical Measurements (4) or **PHSX 536** Electronic Circuit Measurement and Design (4) (Preprofessional emphasis students take both advanced laboratory courses)

**Interdisciplinary Option**

Students also take 12 to 15 credit hours in physics and allied sciences as follows:

2 of the following: (6-7)

- **PHSX 621** Mechanics II (3)
- **PHSX 631** Electromagnetic Theory (3)
- **PHSX 711** Quantum Mechanics (3)
- **PHSX 516** Physical Measurements (4) or **PHSX 536** Electronic Circuit Measurement and Design (4) (Interdisciplinary option students may take the second advanced laboratory courses)

Plus 2 semesters of advanced course work in 1 allied science field chosen from the following:

(6-8)

- **BIOL 350** Principles of Genetics (3)
- **BIOL 400** Fundamentals of Microbiology (3)
- **BIOL 408** Physiology of Organisms (3)
- **BIOL 412** Evolutionary Biology (3)
- **BIOL 416** Cell Structure and Function (3)
- **BIOL 600** Introductory Biochemistry, Lectures (3)
- **BIOL 636** Biochemistry I (3)
- **BIOL 638** Biochemistry II (3)
- **CHEM 598** Research Methods (3) (UKanTeach students only)
- **CHEM 622 210** Fundamentals of Organic Chemistry (3)
- **CHEM 646 530** Physical Chemistry I (3)
- **GEOL 360** Field Investigation (2)
- **GEOL 562** Structural Geology (4)
- **GEOL 572** Geophysics (3)
- **GEOL 575** Seismic Exploration (3)
- **GEOL 576** Potential Fields Exploration (3)
- **GEOL 577** Environmental Geophysics (3)

**Requirements for the B.S. Behavioral Neuroscience Degree**

**Requirements for the B.S. Degree**

**B.S. in Behavioral Neuroscience**

**Nonpsychology General Education Courses**

A total of 84 hours with classes in these 4 areas and additional electives:

**Humanities 24 hours**
- **English**: ENGL 101 and ENGL 102 (6) and ENGL 203, ENGL 205, ENGL 209, ENGL 210, or ENGL 211 (3)
- **Argument and Reason**: COMS 130 or PHIL 148 (3)
- **Western Civilization**: HWC 204-HWC 205 (6)
- **Humanities**: 2 electives (6)

**Natural Sciences 14 hours minimum**
2 of the following 4 sequences, an extension of 1, or an approved alternative.

- **Biology**: BIOL 150 and BIOL 152 (8)
- **Chemistry**: CHEM 184 130 and CHEM 188 135 (10)
- **Physics**: PHSX 114 and PHSX 115 (8)
- **Biological Anthropology**: ANTH 104/ANTH 304 and ANTH 340, ANTH 341, ANTH 350, ANTH 442, or ANTH 447 (6)

**Mathematics 12 hours minimum**
6 hours must be calculus or calculus based.

- MATH 103 (2)
- MATH 115 and MATH 116 (6)
- One additional MATH course (3)

**Computing 6 hours minimum**

- EECS 138 Introduction to Computing: ______ (3)
- The second 3 hours could either be a second semester of EECS 138 (focused on a second programming language) or be from an additional approved course that provides an opportunity to gain computing experience. This second course could be PSYC 480 or PSYC 481 if this Independent Study requires independent, original application of the student’s computing skills such as computer simulation of cognitive processes, or experience with computationally complex neuroscience techniques, such as brain imaging and mapping, or physiological data collection and analysis. (3)

**Behavioral Neuroscience**

**Required Psychology Courses.** A total of at least 40 hours with classes in these 4 areas (28 hours), and additional junior/senior-level psychology electives or approved neuroscience-related courses (12 hours).

**Behavioral Neuroscience Courses 6 hours total**

- PSYC 370/PSYC 371 Brain and Behavior (3)
- PSYC 380/PSYC 381 Brain and Pathology (3)
- PSYC 644 Behavioral Pharmacology (3)

**Laboratory Courses 9 hours total**

- PSYC 200/PSYC 201 Research Methods in Psychology (3)
- PSYC 625 Experimental Psychology: Methods in Neuropsychology and Psychophysiology (6)

**Quantitative Courses 9 hours minimum**
- PSYC 210/PSYC 211 Statistics in Psychological Research (3)
- PSYC 500 Intermediate Statistics in Psychological Research (3)
- PSYC 650 Statistical Methods in Behavioral and Social Science Research I (4)
- PSYC 651 Anova and Other Factorial Designs (4)
- PSYC 679 Applied Nonparametric Statistical Methods (4)
- PSYC 687 Factor Analysis (4)
- PSYC 692 Test Theory (4)
- PSYC 693 Multivariate Analysis (4)
- PSYC 694 Multilevel Modeling I (4)
- PSYC 695 Categorical Data Analysis (4)
- PSYC 696 Structural Equation Modeling I (4)

Applied Research Experience 4 hours minimum
- PSYC 449 Laboratory/Field Work in Human Biology
- PSYC 460 Honors in Psychology
- PSYC 480 Independent Study
- PSYC 481 Research Practicum

Elective Courses in Psychology or Other Disciplines 12 hours minimum (other electives may be accepted with permission of the B.S. director)
- PSYC 418 Introduction to Cognitive Science (3)
- PSYC 432 Human Behavioral Genetics (3)
- PSYC 482 Sensation and Perception (3)
- PSYC 555 Evolutionary Psychology (3)
- PSYC 605 Health Psychology (3)
- PSYC 630 Clinical Psychology (3)
- PSYC 646 Mental Health and Aging (3)
- PSYC 678 Drugs and Behavior (3)
- LING 438 Neurolinguistics (3)
- SPLH 320 Introduction to the Neuroscience of Human Communication (2)

Requirements for the Minor in Astrobiology

Preparatory course work should include calculus (MATH 121 or MATH 116, with MATH 121 preferred) and CHEM 184 or CHEM 188. Additional credit hours in astronomy, biology, chemistry, geology, or physics (ABCGP) are required as follows:

- BIOL 150 Principles of Molecular and Cellular Biology (4)
- GEOL 101 Introduction to Geology (3) or GEOL 105 History of the Earth (3) or GEOL 121 Prehistoric Life: DNA to Dinosaurs (3)
- ASTR 391 Physical Astronomy, Honors (3)
- ASTR 394 The Quest for Extraterrestrial Life (3) or 3 credit hours of undergraduate research in astrobiology (3)
- 6 credit hours of course work in ABCGP at the 300-level or higher and not in the student's major field (6)

5. Proposal for a change to criteria for selecting the BGS Liberal Arts and Science Degree option
   Proposal:
Change the requirements for officially selecting the BGS LA&S degree option so that students can access the correct ARTS/DPR information sooner in their academic career.

**Declaration of BGS Non-major Degree Option**

**Administrative Requirements**
The following requirements have been developed to encourage:

1. Satisfactory completion of all Math and English General Education Requirements.
   - Courses:
     - ENGL 101, 102, and 3rd English (ENGL 203, 205, 209, 210, or 211)
     - MATH 002 (if required), 101, and 2nd Math (MATH 105, 106, 111, 115, 121, 141, 365, or BIOL 570)
   - Rationale: To encourage a strong foundation of basic skills early in the curriculum.

2. Satisfactory completion of courses from 15 departments in the College of Liberal Arts and Sciences.
   - Rationale: To encourage full exploration of potential major/area of interest.

3. Good Academic Standing, KU cumulative GPA of 2.0 or better.
   - Rationale: To maintain advising support for students in academic difficulty.

**Proposed Declaration of BGS Non-major Degree Option**

**Administrative Requirements**
The following requirements have been developed to encourage:

1. Satisfactory completion of all Math and English General Education Requirements.
   - Courses:
     - ENGL 101, 102, and 3rd English (ENGL 203, 205, 209, 210, or 211)
     - MATH 002 (if required), 101, and 2nd Math (MATH 105, 106, 111, 115, 121, 141, 365, or BIOL 570)
   - Rationale: To encourage a strong foundation of basic skills early in the curriculum.

2. Satisfactory completion of courses from at least 10 departments in the College of Liberal Arts and Sciences, or junior status.
   - Rationale: To encourage full exploration of potential major/area of interest.

3. Good Academic Standing, KU cumulative GPA of 2.0 or better.
   - Rationale: To maintain advising support for students in academic difficulty.

**Justification:**
The “admission” requirements for this option are the same as the ultimate completion requirements (completion of courses from 15 departments in CLAS). Typically completion of the 15 department exploration requirement is the final outstanding area requirement, so students are never allowed to select the program/plan code for the option they are pursuing, and are not able to easily access the requirements for this option via their ARTS form or DPR. This causes problems for students who are trying to apply to graduate, as they cannot apply for a program/plan code that is not yet listed in Enroll & Pay, and they are not allowed to list it until after completion of all 15 department courses. Further, students list an incorrect major code for their program/plan in order to avoid the non-declared hold because they cannot select the BGS LA&S code.