COLLEGE OF SCIENCE
Proposed Catalog Changes

Effective Term (unless otherwise noted) = Summer 2015

Biological Sciences

1. Add the following courses:

   **Biol 301 Undergraduate Research (1-4 cr, max 8)**
   Undergraduate research for students without senior standing.  
   **Prereq:** Permission

   **Rationale:** This course differentiates undergraduate research from the 401 course (which requires senior standing and qualifies as senior experience).

   **Biol 416 Plant Diversity and Evolution (4 cr)**
   Origin, evolution, and diversity of major land plant groups; emphasis on systematics, anatomy, morphology, ecological diversity, and macroevolution. Two lec and one 3-hr lab a wk; one field trip. Cooperative: open to WSU degree-seeking students. (Fall only)
   **Prereq:** Biol 114 and Biol 115

   **Rationale:** This course is a new offering in the Bio Sci curriculum and fills a gap in the diversity/natural history courses currently offered by focusing on the major evolutionary trends that have shaped the diversity of plant life that we see today. In addition, it will add diversity to the pool of upper division elective courses available for majors in Biological Sciences.

   **Coop Rationale:** WSU has offered a similar course in the past – Biology 470: Diversity of Plants – but it has not been offered since 2007 and there are no immediate plans to teach this course again. Co-op listing this course would strengthen both Biology programs, and provide efficiencies in instruction by utilizing the expertise of UI faculty (Tank).

   **Biol J460/J560 Advanced Field Botany (3 cr)**
   Hands-on training in field botany as applied to evolutionary, ecological, and floristic studies; two-week field course in the Inland Northwest. Additional projects/assignments reqd for grad cr. (Summer only)
   **Prereq:** Instructor Permission

   **Rationale:** This 2-week field course represents the educational component to Dr. Tank’s current National Science Foundation CAREER award, and was offered in 2013 and 2014 as a special topics course. With NSF funding to teach for at least 3 more years, and plans to continue provided sufficient student enrollment to make it financially feasible, a formal course number and inclusion in the catalog would make this course more visible to students and more straightforward to include on student study plans with. In addition, it will add diversity to the pool of upper division elective courses available for majors in Biological Sciences, graduate level offerings, and increases field-based courses at UI.

   **Biol 536 Phylogenetics Reading Group (1 cr)**
   Review recent articles in phylogenetics and systematics journals. Students choose, critically review, and discuss the articles to develop critical-thinking skills and confidence in their knowledge of the literature. Graded P/F. Cooperative: open to WSU degree-seeking students.

   **Rationale:** This request is to bring a new graduate seminar course to the Department of Biological Sciences. The course was originally listed as FOR 556, but the faculty member who teaches this course has moved to the Department of Biological Sciences. It was offered as a BIOL Special Topics course in Spring and Fall, 2014, and continues to play an important role in graduate student education.

   **Coop Rationale:** This seminar course was originally started as a joint journal club between researchers at UI and WSU. It continues to have broad participation from the evolution, ecology, and systematics community at both UI and WSU, including professors, postdocs, and graduate students. A co-op offering of this course would continue to strengthen the evolution, ecology, and systematics community on the Palouse, and support collaborative research in this area.

2. Reactivate and change the following course:

   **Biol 484 Invertebrate Zoology (4 cr)**
   Morphology of freshwater, marine, and terrestrial invertebrates and phylogeny of major groups. Three lec and one 3-hr lab a wk.
   **Prereq:** Biol 114 and Biol 115

   **Rationale:** This request is to re-activate a dormant course, previously part of the Bio Sci curriculum. It will add diversity to the pool of upper division elective courses available for majors in Biological Sciences.
3. Change the following courses:

**Biol 116-114 Organisms and Environments (4 cr)**
The evolution of diversity, the biology of plants and animals, and their environments. Three lec and one 3-hr lab a wk.
**Prereq:** Biol 115 and Chem 101 or 111

Rationale: During the recent curriculum overhaul in Biological Sciences it emerged that Biol 116 would be a better introductory (first semester) course for majors in the discipline, than Biol 115. Re-numbering this course (i.e., Biol 114) and removing the pre-requisites would permit use of this course ahead of Biol 115 (which would follow in the second semester). It is anticipated that better student retention will occur with this sequence. This change will have no financial/resource impact on the department/college.

**Biol 401 Undergraduate Research (1-4 cr, max 8)**
Same as MMBB 401. **Individual Study, Undergraduate research at the senior level.**
**Prereq:** Senior Standing and Permission of Instructor

Rationale: This change streamlines and combines undergraduate research for senior experience into a single course (rather than up to four discipline specific courses). This course requires senior standing and qualifies as a senior experience.

**Biol 456 Computer Skills for Biologists (3 cr)**
Management and analysis of complicated datasets such as those in molecular evolution, systematics, and genomics. Demonstrations, exercises, and student projects to teach advanced Unix skills, programming (e.g. Perl and R), and data management. **Cooperative: open to WSU degree-seeking students.** (Fall, alt/even yrs)
**Prereq:** Biol 310; and Stat 251 or Stat 301; or Permission

Coop Rationale: Support partnership with WSU.

**Biol 522 Molecular Evolution (3 cr)**
Understanding evolutionary processes and patterns at the molecular level, techniques for using genetic and genomic data to understand evolutionary history of organisms, 3 lectures per week. **Cooperative: open to WSU degree-seeking students.**
**Prereq:** Undergraduates require permission of Instructor

Coop Rationale: Support partnership with WSU.

**Biol 545 Principles of Systematic Biology (3 cr)**
The inference of evolutionary trees (phylogeny) and the processes that generate biodiversity from analyses of morphological, molecular, and behavioral data; uses of phylogenies in testing evolutionary and other hypotheses at both inter and intraspecific levels. Two hrs of lec and one 3-hr lab a wk. **Cooperative: open to WSU degree-seeking students.** (Spring, Alt yrs)
**Prereq:** Plsc 205 or Biol 213; and Biol 310

Coop Rationale: Support partnership with WSU.

**MMBB Biol 154 Introductory Microbiology (3 cr)**
Carries no credit after Biol 250. May be taken by microbiology majors, but carries no cr after Biol 250. Introduction to microorganisms and their role in disease, health, foods, and the environment; current topics in microbiology. (Spring only)

Rationale: We are renaming this course to Biol 154 to reflect the fact that Biology now teaches the course.

4. Change the curricular requirements of **Biochemistry (B.S.Biochem.):**

Required course work includes the university requirements (see regulation J-3) and:

| Biol 101 | Perspectives in Biology (1 cr) |
| Biol 114 | Organisms and Environments (4 cr) |
| Biol 115 | Cells and the Evolution of Life (4 cr) |
| Biol 310 | Genetics (3 cr) |
| Biol 312 | Molecular and Cellular Biology (3 cr) |
| Biol 313 | Molecular and Cellular Laboratory (1 cr) |
| Biol 315 | Genetics Lab (1 cr) |
| Biol 380, Biol 382 | Biochemistry I and Lab (6 cr) |
| Biol 400 | Seminar (1 cr) |
| Biol 454 | Biochemistry II (3 cr) |
| Chem 111 | Principles of Chemistry I (4 cr) |
| Chem 112 | Principles of Chemistry II (5 cr) |
| Chem 253, Chem 254 | Quantitative Analysis and Lab (5 cr) |
| Chem 277 | Organic Chemistry I (3 cr) |
Chem 278  Organic Chemistry I: Lab (1 cr)
Chem 305  Physical Chemistry (3 cr)
Chem 306  Physical Chemistry (3 cr)
Chem 372  Organic Chemistry II (3 cr)
Chem 374  Organic Chemistry II: Lab (1 cr)
Math 170  Analytic Geometry and Calculus I (4 cr)
Math 175  Analytic Geometry and Calculus II (4 cr)
Math 276  Analytic Geometry and Calculus III (3 cr)
MMBB 400  Seminar (1 cr)
Phys 211  Engineering Physics I (4 cr)
Phys 212  Engineering Physics II (4 cr)
Stat 251  Statistical Methods (3 cr)

One of the following (3-4 cr):
Biol 310, Biol 315
Gene 314  General Genetics (3 cr)

One of the following (3 cr):
Chem 302  Principles of Physical Chemistry (3 cr)
Chem 305  Physical Chemistry (3 cr)
Chem 306  Physical Chemistry (3 cr)

One of the following (3 cr):
Engl 207  Persuasive Writing (3 cr)
Engl 208  Personal and Exploratory Writing (3 cr)
Engl 317  Technical Writing (3 cr)

One of the following Senior Experience Courses (2 cr):
Biol 401  Undergraduate Research (1-4 cr, max 8)
Biol 405  Practicum in Anatomy Laboratory Teaching (2 cr)
Biol 407  Practicum in Biology Laboratory Teaching (2 cr)
Biol 408  Practicum in Human Physiology Laboratory Teaching (2 cr)
Biol 411  Senior Capstone (2 cr)

Select two six credits of the following (5-6 cr):
Biol 432  Immunology (3 cr)
Biol 444  Genomics (3 cr)
Biol 461  Neurobiology (3 cr)
Biol 482  Protein Structure and Function (3 cr)
Biol 485  Prokaryotic Molecular Biology (3 cr)
Biol 487  Eukaryotic Molecular Genetics (3 cr)
Chem 374  Organic Chemistry II: Lab (1 cr)
Chem 472  Rational Design of Pharmaceuticals (3 cr)
Chem 473  Intermediate Organic Chemistry (3 cr)
FS 520  Instrumental Analysis (2 cr)
MMBB 409  Immunology (3 cr)
MMBB 482  Protein Structure and Function (3 cr)
MMBB 485  Prokaryotic Molecular Biology (3 cr)
MMBB 486  Plant Biochemistry (3 cr)
MMBB 487  Eukaryotic Molecular Genetics (3 cr)
MMBB 488  Genetic Engineering (3 cr)
PISc 488  Genetic Engineering (3 cr)

Courses to total 120 credits for this degree

Rationale: The Biological Sciences department has assumed responsibility for this degree as a result of the recent dissolution of the MMBB department. These changes in curriculum harmonize this degree with the other degrees in the Biology department (Biology, Molecular Biology, and Microbiology). Harmonizing these degrees results in a simplified advising and administration structure, more flexibility for students, and greater efficiency of use for teaching resources within the Department of Biological Sciences.

5. Change the curricular requirements of Biology (B.S. or B.A.):

To graduate in this program, students must earn a minimum grade of C in Biol 114 and Biol 115, and Biol 116 and must have a minimum gpa of 2.40 in Biol 115, Biol 116, Biol 213, Biol 310, and Biol 312.

Required course work includes the university requirements (see regulation J-3) and the following major requirements (electives to be chosen in consultation with the departmental advisor):

Biol 101  Perspectives in Biology (1 cr)
Biol 114  Organisms & Environments (4 cr)
Biol 115  Cells and the Evolution of Life (4 cr)
Biol 116  Organisms & Environments (4 cr)
Biol 213  Principles of Biological Structure and Function (4 cr)
Biol 310, Biol 315
Biol 312 Molecular and Cellular Biology (3 cr)
Biol 313 Molecular and Cellular Laboratory (1 cr)
Biol 314 Ecology and Population Biology (4 cr)
Biol 315 Genetics Lab (1 cr)
Biol 400 Seminar (1 cr)
Biol 421 Advanced Evolutionary Biology (3 cr)
Chem 111 Principles of Chemistry I (4 cr)
Chem 112 Principles of Chemistry II (5 cr)
Chem 277, Chem 278 Organic Chemistry and Lab (4 cr)
Math 170 Analytic Geometry and Calculus I (4 cr)
Phys 111, Phys 111L General Physics I and Lab (4 cr)
Phys 112, Phys 112L General Physics II and Lab (4 cr)
Stat 251 Statistical Methods (3 cr)
One of the following (3-4 cr):
Biol 300 Survey of Biochemistry (3 cr)
Biol 380 Biochemistry I (4 cr)
One of the following Senior Experience Courses (2 cr):
Biol 401 Undergraduate Research (1-4 cr, max 8)
Biol 405 Practicum in Anatomy Laboratory Teaching (2 cr)
Biol 407 Practicum in Biology Laboratory Teaching (2 cr)
Biol 408 Practicum in Human Physiology Laboratory Teaching (2 cr)
Biol 411 Senior Capstone (2 cr)
One of the following (3 cr):
Engl 207 Persuasive Writing (3 cr)
Engl 208 Personal and Exploratory Writing (3 cr)
Engl 317 Technical Writing (3 cr)
One of the following (4 cr):
Phys 111, Phys 111L General Physics I and Lab (4 cr)
Phys 211, Phys 211L Engineering Physics I and Lab (4 cr)
Phys 212, Phys 212L Engineering Physics II and Lab (4 cr)
One of the following (3 cr):
Stat 251 Statistical Methods (3 cr)
Stat 301 Probability and Statistics (3 cr)
One of the following (2 cr):
Biol 405 Practicum in Anatomy Laboratory Teaching (2 cr)
Biol 407 Practicum in Biology Laboratory Teaching (2 cr)
Biol 408 Practicum in Human Physiology Laboratory Teaching (2 cr)
Biol 411 Senior Capstone (2 cr)
Biol 495 Research in Molec/Cell/Dev Biology (2 cr)
Biol 496 Research in Ecology and Evolution (2 cr)
Biol 497 Research in Anatomy and Physiology (2 cr)
One of the following (4 cr):
Chem 275, Chem 276 Carbon Compounds and Lab (4 cr)
Chem 277, Chem 278 Organic Chemistry and Lab (4 cr)
One of the following (4 cr):
Math 160 Survey of Calculus (4 cr)
Math 170 Analytic Geometry and Calculus I (4 cr)
One of the following (3-4 cr):
Biol 300 Survey of Biochemistry (3 cr)
Biol 380 Biochemistry I (4 cr)

NOTE: Students considering graduate school in biology are strongly encouraged to take Math 170, Chem 277/278, and Biol 380.
9-14 credits of approved electives from the following list are required. (Categories are intended only as a guide for student and advisor use). Additional classes can be substituted with prior approval of adviser and chairperson.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>Biol 324</td>
<td>Comparative Vertebrate Anatomy</td>
<td>4 cr</td>
</tr>
<tr>
<td>Biol 416</td>
<td>Plant Diversity and Evolution</td>
<td>4 cr</td>
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<tr>
<td>Biol 423</td>
<td>Comparative Vertebrate Physiology</td>
<td>3 cr</td>
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<tr>
<td>Biol 425</td>
<td>Special Topics: Experimental Field Ecology</td>
<td>3 cr</td>
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<tr>
<td>Biol 428</td>
<td>Microscopic Anatomy</td>
<td>4 cr</td>
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<td>Biol 432</td>
<td>Immunology</td>
<td>3 cr</td>
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<tr>
<td>Biol 444</td>
<td>Genomics</td>
<td>3 cr</td>
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<tr>
<td>Biol 448</td>
<td>Plant-Animal Interactions</td>
<td>3 cr</td>
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<td>Biol 456</td>
<td>Computer Skills for Biologists</td>
<td>3 cr</td>
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<tr>
<td>Biol 460</td>
<td>Advanced Field Botany</td>
<td>3 cr</td>
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<tr>
<td>Biol 461</td>
<td>Neurobiology</td>
<td>3 cr</td>
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<tr>
<td>Biol 474</td>
<td>Principles of Developmental Biology</td>
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<td>Biol 478</td>
<td>Animal Behavior</td>
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<td>Biol 482</td>
<td>Protein Structure and Function</td>
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<td>Biol 483</td>
<td>Mammalogy</td>
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<td>Biol 484</td>
<td>Invertebrate Zoology</td>
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<td>Herpetology</td>
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<td>Chem 414</td>
<td>Applications of Nanomaterials in Biomolecular Engineering</td>
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<td>Ent 441</td>
<td>Insect Ecology</td>
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<tr>
<td>Fish 481</td>
<td>Ichthyology</td>
<td>4 cr</td>
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<tr>
<td>Math 437</td>
<td>Mathematical Biology</td>
<td>3 cr</td>
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<td>PSc 415</td>
<td>Plant Pathology</td>
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<td>PSc 440</td>
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<td>PSc 476</td>
<td>Cell Biology</td>
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<td>REM 341</td>
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<td>WLF 440</td>
<td>Conservation Biology</td>
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<td>WLF 448</td>
<td>Fish and Wildlife Population Ecology</td>
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<td>WLF 482</td>
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**Natural History**

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<td>REM 341</td>
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<td>WLF 482</td>
<td>Ornithology</td>
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**Anatomy/Physiology**

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<td>MMBB 460</td>
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<td>PSc 415</td>
<td>Plant Pathology</td>
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**Quantitative/Integrative Biology**

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<tr>
<td>Biol 425</td>
<td>Special Topics: Experimental Field Ecology</td>
<td>3 cr</td>
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<td>Biol 448</td>
<td>Plant-Animal Interactions</td>
<td>3 cr</td>
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<td>Biol 456</td>
<td>Computer Skills for Biologists</td>
<td>3 cr</td>
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<tr>
<td>Ent 441</td>
<td>Insect Ecology</td>
<td>3 cr</td>
</tr>
<tr>
<td>Math 437</td>
<td>Mathematical Biology</td>
<td>3 cr</td>
</tr>
<tr>
<td>MMBB 425</td>
<td>Microbial Ecology</td>
<td>3 cr</td>
</tr>
<tr>
<td>WLF 440</td>
<td>Conservation Biology</td>
<td>3 cr</td>
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<tr>
<td>WLF 448</td>
<td>Fish and Wildlife Population Ecology</td>
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**Molecular/Cellular/Developmental (MCD) Biology**

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<td>Biol 461</td>
<td>Neurobiology</td>
<td>3 cr</td>
</tr>
<tr>
<td>Biol 474</td>
<td>Principles of Developmental Biology</td>
<td>3 cr</td>
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<tr>
<td>Chem 414</td>
<td>Applications of Nanomaterials in Biomolecular Engineering</td>
<td>3 cr</td>
</tr>
<tr>
<td>MMBB 409</td>
<td>Immunology</td>
<td>3 cr</td>
</tr>
<tr>
<td>MMBB 440</td>
<td>Advanced Lab Techniques</td>
<td>4 cr</td>
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<td>MMBB 475</td>
<td>Cell Biology</td>
<td>3 cr</td>
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<tr>
<td>MMBB 489</td>
<td>Genetic Engineering</td>
<td>3 cr</td>
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</table>

In addition to the above electives, Biology majors are encouraged to enroll in at least 3 credits of coursework that emphasizes social, political or philosophical aspects of biology. A list of suggested courses will be provided by the student's advisor and is available on the department's website.
Biology B.A. students must also complete:
6 credits (two courses) in the humanities in addition to the minimum university-wide general education requirement of 14 credits in the humanities/social sciences*
3 credits (one course) in the social sciences in addition to the minimum university-wide general education requirement of 14 credits in the humanities/social sciences*
Foreign Languages 0-16 credits (zero-four courses) competence in one foreign language equivalent to that gained by the completion of four semesters of college courses through the intermediate level. This requirement may be satisfied by the completion of either of the following options (1) 16 credits or four high-school units in one foreign language, or (2) 12 credits in one foreign language, and one three-credit course in literature translated from the same language. The 12 credits may be satisfied by three high-school units in one foreign language.
*Courses satisfying the humanities requirement are those dealing with the arts, literature, and philosophy. Courses satisfying the social science requirement are those courses dealing with a person’s social condition including social relations, institutions, history, and participation in an organized community. Refer to online degree audit system through Web registration system or your academic advisor for a listing of appropriate courses.

Biology B.S. students must also complete:
3 credits (one course) in the humanities in addition to the minimum university-wide general education requirement of 14 credits in the humanities/social sciences*
3 credits (one course) in the social sciences in addition to the minimum university-wide general education requirement of 14 credits in the humanities/social sciences*
*Courses satisfying the requirement are those dealing with the arts, literature, and philosophy. Courses satisfying the social sciences requirement are those courses dealing with a person’s social condition including social relations, institutions, history, and participation in an organized community. Refer to online degree audit system through Web registration system or your academic advisor for a listing of appropriate courses.
A student may substitute for these requirements the successful completion of an academic minor or an area of emphasis of at least 18 credits approved by the Biological Sciences Department.
Courses to total 120 credits for this degree

Rationale: None Provided

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6. Change the curricular requirements of Microbiology (B.S. Microbiol.):

To graduate in this program, students must earn a minimum grade of C in Biol 114 and Biol 115. Required course work includes the university requirements (see regulation J-3) and:

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<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>Biol 101</td>
<td>Perspectives in Biology (1 cr)</td>
</tr>
<tr>
<td>Biol 114</td>
<td>Organisms &amp; Environments (4 cr)</td>
</tr>
<tr>
<td>Biol 115</td>
<td>Cells and the Evolution of Life (4 cr)</td>
</tr>
<tr>
<td>Biol 250, Biol 255</td>
<td>General Microbiology and Lab (5 cr)</td>
</tr>
<tr>
<td>Biol 310, Biol 315</td>
<td>Genetics and Lab (4 cr)</td>
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<tr>
<td>Biol 312</td>
<td>Molecular and Cellular Biology (3 cr)</td>
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<tr>
<td>Biol 313</td>
<td>Molecular and Cellular Laboratory (1 cr)</td>
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<tr>
<td>Biol 380</td>
<td>Biochemistry I (4 cr)</td>
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<tr>
<td>Biol 400</td>
<td>Seminar (1 cr)</td>
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<tr>
<td>Chem 111</td>
<td>Principles of Chemistry I (4 cr)</td>
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<td>Chem 112</td>
<td>Principles of Chemistry II (5 cr)</td>
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<td>Chem 253, Chem 254</td>
<td>Quantitative Analysis and Lab (5 cr)</td>
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<td>Chem 277</td>
<td>Organic Chemistry I: Lab (1 cr)</td>
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<td>Chem 278</td>
<td>Organic Chemistry I (3 cr)</td>
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<td>Math 170</td>
<td>Analytic Geometry and Calculus I (4 cr)</td>
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<td>MMBB 154</td>
<td>Introductory Microbiology (3 cr)</td>
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<td>MMBB 400</td>
<td>Seminar (1 cr)</td>
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<td>Stat 251</td>
<td>Statistical Methods (3 cr)</td>
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<tr>
<td>One of the following (4 cr):</td>
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<tr>
<td>Biol 310, Biol 315</td>
<td>Genetics and Lab (4 cr)</td>
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<td>Biol 380</td>
<td>Biochemistry I (4 cr)</td>
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<tr>
<td>One of the following (4 cr):</td>
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<tr>
<td>Biol 401</td>
<td>Undergraduate Research (4 cr in one semester)</td>
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<tr>
<td>PSc 440</td>
<td>Advanced Laboratory Techniques (4 cr)</td>
</tr>
<tr>
<td>One of the following Senior Experience Courses (2 cr):</td>
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</table>
Biol 401  Undergraduate Research (1-4 cr, max 8)
Biol 405  Practicum in Anatomy Laboratory Teaching (2 cr)
Biol 407  Practicum in Biology Laboratory Teaching (2 cr)
Biol 408  Practicum in Human Physiology Laboratory Teaching (2 cr)
Biol 411  Senior Capstone (2 cr)

One of the following (3 cr):
Engl 207  Persuasive Writing (3 cr)
Engl 208  Personal and Exploratory Writing (3 cr)
Engl 317  Technical Writing (3 cr)

One of the following (4 cr):
Math 160  Survey of Calculus (4 cr)
Math 170  Analytic Geometry and Calculus I (4 cr)

One of the following (4 cr):
MMBB 401  Undergraduate Research (4 cr in one semester)
MMBB 440  Advanced Laboratory Techniques (4 cr)

One of the following (4 cr):
Phys 111, Phys 111L  General Physics I and Lab (4 cr)
Phys 211, Phys 211L  Engineering Physics I and Lab (4 cr)

One of the following (4 cr):
Phys 112, Phys 112L  General Physics II and Lab (4 cr)
Phys 212, Phys 212L  Engineering Physics II and Lab (4 cr)

At least two 15 credits of the following microbiology electives (6 cr):

Biol 432  Immunology (3 cr)
Biol 433  Pathogenic Microbiology (3 cr)
Biol 441  Cellular and Molecular Basis of Disease (3 cr)
Biol 447  Virology (3 cr)
Biol 462  Molecular Parasitology (3 cr)
Biol 482  Protein Structure and Function (3 cr)
Biol 485  Prokaryotic Molecular Biology (3 cr)
Biol 487  Eukaryotic Molecular Genetics (3 cr)
PSc 476  Cell Biology (3 cr)
PSc 488  Genetic Engineering (3 cr)
Soil 425  Microbial Ecology (3 cr)

MMBB 409  Immunology (3 cr)
MMBB 412  Pathogenic Microbiology (3 cr)
MMBB 432  Virology (3 cr)
MMBB 460  Microbial Physiology (3 cr)
MMBB 466  Molecular Parasitology (3 cr)

At least two of the following molecular biology electives (5-6 cr):

MMBB 422  Cellular and Molecular Basis of Disease (3 cr)
MMBB 475  Cell Biology (3 cr)
MMBB 486  Prokaryotic Molecular Biology (3 cr)
MMBB 487  Eukaryotic Molecular Genetics (3 cr)
MMBB 488  Genetic Engineering (3 cr)

Science Electives (6 cr)

One of the following (3 cr):
Stat 251  Statistical Methods (3 cr)
Stat 301  Probability and Statistics (3 cr)

Courses to total 120 credits for this degree

Note for double majors in Molecular Biology and Microbiology: Elective courses that count toward one degree cannot be counted as a science elective in the second degree.

Rationale: The Biological Sciences department has assumed responsibility for this degree as a result of the recent dissolution of the MMBB department. These changes in curriculum harmonize this degree with the other degrees in the Biology department (Biology, Molecular Biology, and Biochemistry). Harmonizing these degrees results in a simplified advising and administration structure, more flexibility for students, and greater efficiency of use for teaching resources within the Department of Biological Sciences.
7. Change the curricular requirements of Molecular Biology and Biotechnology (B.S.M.B.B.):

To graduate in this program, students must earn a minimum grade of C in Biol 114 and Biol 115. Required course work includes the university requirements (see regulation J-3) and:

- **Biol 101** Perspectives in Biology (1 cr)
- **Biol 114** Organisms & Environments (4 cr)
- **Biol 115** Cells and the Evolution of Life (4 cr)
- **Biol 250, Biol 255** General Microbiology and Lab (5 cr)
- **Biol 310, Biol 315** Genetics and Lab (4 cr)
- **Biol 312** Molecular and Cellular Biology (3 cr)
- **Biol 313** Molecular and Cellular Laboratory (1 cr)
- **Biol 380, Biol 382** Biochemistry I and Lab (6 cr)
- **Biol 400** Seminar (1 cr)
- **Biol 454** Biochemistry II (3 cr)
- **Chem 111** Principles of Chemistry I (4 cr)
- **Chem 112** Principles of Chemistry II (5 cr)
- **Chem 253, Chem 254** Quantitative Analysis and Lab (5 cr)
- **Chem 277** Organic Chemistry I (3 cr)
- **Chem 278** Organic Chemistry I: Lab (1 cr)
- **Chem 372** Organic Chemistry II (3 cr)
- **Math 170** Analytic Geometry and Calculus I (4 cr)

One of the following (3-4 cr):
- **Biol 310, Biol 315** Genetics and Lab (4 cr)
- **Gene 314** General Genetics (3 cr)

One of the following (4 cr):
- **Math 180** Survey of Calculus (4 cr)
- **Math 170** Analytic Geometry and Calculus I (4 cr)

One of the following (3 cr):
- **MMBB 400** Seminar (1 cr)
- **MMBB 485** Genetic Engineering (3 cr)

**Stat 351** Statistical Methods (3 cr)

One of the following (3-4 cr):
- **Biol 310, Biol 315** Genetics and Lab (4 cr)
- **Gene 314** General Genetics (3 cr)

One of the following (4 cr):
- **Math 180** Survey of Calculus (4 cr)
- **Math 170** Analytic Geometry and Calculus I (4 cr)

One of the following (3 cr):
- **MMBB 485** Prokaryotic Molecular Biology (3 cr)
- **MMBB 487** Eukaryotic Molecular Genetics (3 cr)

**Select three of the following (8-10 cr):**
- **Biol 432** Immunology (3 cr)
- **Biol 433** Pathogenic Microbiology (3 cr)
- **Biol 444** Virology (3 cr)
- **Biol 447** Virology (3 cr)
- **Biol 461** Neurobiology (3 cr)
- **Biol 462** Molecular Parasitology (3 cr)
- **Biol 474** Principles of Developmental Biology (3 cr)
- **Biol 482** Protein Structure and Function (3 cr)
- **Biol 485** Prokaryotic Molecular Biology (3 cr)
- **Biol 487** Eukaryotic Molecular Genetics (3 cr)
- **FS 520** Instrumental Analysis (2 cr)
- **Pisc 476** Cell Biology (3 cr)

One of the following (4 cr):
- **Biol 401** Undergraduate Research (4 cr)
- **Pisc 440** Advanced Laboratory Techniques (4 cr)

One of the following Senior Experience Courses (2 cr):
- **Biol 401** Undergraduate Research (3-4 cr, max 8)
- **Biol 405** Practicum in Anatomy Laboratory Teaching (2 cr)
- **Biol 407** Practicum in Biology Laboratory Teaching (2 cr)
- **Biol 408** Practicum in Human Physiology Laboratory Teaching (2 cr)
- **Biol 411** Senior Capstone (2 cr)

One of the following (3 cr):
- **Engl 207** Persuasive Writing (3 cr)
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engl 208</td>
<td>Personal and Exploratory Writing (3 cr)</td>
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<tr>
<td>Engl 317</td>
<td>Technical Writing (3 cr)</td>
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One of the following (4 cr):

- Phys 111, General Physics I (4 cr)
- Phys 111L
- Phys 211, Engineering Physics I (4 cr)
- Phys 211L

One of the following (4 cr):

- Phys 112, General Physics II (4 cr)
- Phys 112L
- Phys 212, Engineering Physics II (4 cr)
- Phys 212L

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
</tr>
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<tbody>
<tr>
<td>MMBB 401</td>
<td>Undergraduate Research (4 cr)</td>
<td></td>
</tr>
<tr>
<td>MMBB 440</td>
<td>Advanced Laboratory Techniques (4 cr)</td>
<td></td>
</tr>
<tr>
<td>MMBB 490</td>
<td>Directed Study (4 cr)</td>
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</tbody>
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Select two of the following (5-6 cr):

- Biol 444, Genomics (3 cr)
- MMBB 409, Immunology (3 cr)
- MMBB 412, Pathogenic Microbiology (3 cr)
- MMBB 422, Cellular and Molecular Basis of Disease (3 cr)
- MMBB 432, Virology (3 cr)
- MMBB 475, Cell Biology (3 cr)
- MMBB 485, Eukaryotic Molecular Biology (3 cr)*
- MMBB 487, Eukaryotic Molecular Genetics (3 cr)*

One of the following (3 cr):

- Stat 251, Statistical Methods (3 cr)
- Stat 301, Probability and Statistics (3 cr)

Courses to total 120 credits for this degree

Note: Either MMBB. Biol 485 or MMBB. Biol 487 may be used as an elective if not taken above as a required course.

Rationale: The Biological Sciences department has assumed responsibility for this degree as a result of the recent dissolution of the MMBB department. These changes in curriculum harmonize this degree with the other degrees in the Biology department (Biology, Molecular Biology, and Biochemistry). Harmonizing these degrees results in a simplified advising and administration structure, more flexibility for students, and greater efficiency of use for teaching resources within the Department of Biological Sciences.

**Geography**

1. Add the following courses:

**Geog 260  Introduction to Geopolitics (3 cr)**

The course introduces students to contemporary approaches to geopolitics through the exploration of key geographic concepts and the ideas of structure and agency. Topics include terrorism, nationalism, militarism, borders, and environmental geopolitics. Current events are discussed to exemplify the concepts.

Rationale: One goal of the UI strategic plan is to provide students with the opportunity to become globally aware citizens. We plan to request that this course be listed in the General Ed menus for Social Science and International courses. As Geography is a “discovery” discipline, another goal is that this will be a good gateway course for increasing the number of majors in Geography. It will also serve majors in International Studies, Political Science, Agriculture and Engineering. It will be staffed by a new faculty hire, who taught this course at his previous university, where it was a very popular course. Next year when we revamp our BS requirements for the first time in some years, it will be added to our menu of courses satisfying degree requirements in Human Geography.

**Geog 430  Climate Change Ecology (3 cr)**

Climate change impacts on ecosystems, plants, and animals; feedbacks to climate change; climate change mitigation related to ecosystems and species.

**Prerequisite:** Biol 114 or EnvS 101 or Geog 100 or For 221 or REM 221 or Permission of Instructor

Rationale: This request is for a formal number of a special topics course offered in Spring 2013 and is part of the undergraduate minor in climate change. This course fills a gap in climate change-related courses and is in the rotation of a tenure-track faculty member to be taught in alternate spring semesters. This course is unique within the Department of Geography and unique across UI; no other course focuses exclusively on how climate change affects plants and animals, and no other course addresses how plants and animals can influence future climate change. Given the importance of natural and agricultural resources at UI as well as the societal and environmental importance of climate change, this course fills a key need. When contacted, chairs and other faculty members in departments and colleges other than Geography and COS expressed interest and enthusiasm for this course. This course is distinct from Biogeography (GEOG 410) because 410 covers many more topics than climate change (which is addressed in
10% of 410), such as such as the influences of geology, evolution, and competition/predation on plant/animal distributions; biodiversity/island biogeography theory; and other influences on species such as land use change, poaching, etc. In contrast, Climate Change Ecology explores only the topic of climate change, and in addition, addresses topics not covered in Biogeography such as physical climate science (as background), feedbacks to climate change via biogeophysical and biogeochemical processes, and the role of plants/animals/ecosystems in climate change adaptation and mitigation.

Geog 489 Capstone Preparation (1 cr)
Planning and preparation for senior project to be carried out in subsequent semester. Students learn expectations for the senior project, plan their project, gather data and other resources and develop an agreement with their faculty mentor.

Rationale: This course supports learning outcomes for our BS program, which include the development of problem-solving skills, as evidenced in part by the completion of a major project in the Senior Capstone course (GEOG 493) taken in the last semester of student’s senior year. The new proposed course is intended to be taken in the semester prior to taking the Capstone course. It will be highly recommended but not required for students. It is not required because approximately 20% of our students are fall graduates for whom we combine this with the capstone class as a directed study. This course has been run as a Special Topics course for two years; faculty and student feedback (as part of Face-to-Face Findings in Outcomes Assessment) has indicated that it has improved the quality and scope of the student projects in the Capstone class and allowed greater understanding of expectations by both student and faculty mentors in the Capstone course.

2. Change the following courses:

Geog 240 J345/J545 Global Economic Geography (3 cr)
An overview of major developments and contemporary debates in the economic geography literature: economic globalization, the spatial dimensions of resource use, agriculture, industry, and post-industry landscapes, economic aspects of land-use change, location theory and case studies. Additional projects required for graduate credit. Reciprocal relations between people and the earth environment within an economic framework; resource distribution, developmental alternatives, movement, processing and industrialization, local to global perspective, theories and case studies.

Rationale: The change from 200 to 300-level makes this course consistent with other courses in human geography in our department. The course title and description update arise from the hire of a new faculty member whose expertise is in Economic Geography who will be teaching the course on a regular basis. Creating the joint-listed graduate course supports strengthening the Human Geography offerings in our program and will also serve students in Bioregional Planning, Business, and Agricultural Economics.

Geog 440 The New Global Alternative Spatial Economy (3 cr)
Course will explore alternative approaches to neoclassical economics and classical economic geography at the global and regional scale useful in economic geography. Steady state economy, New-Keynesianism, dependence and uneven development, the world-systems perspective, evolutionary economics and Marxist perspectives are presented. The course will explore the structures of globalization from convergence and labor migration to trade bloc formation and regional specialization. An understanding of the role of location in the creation and modification of global, national and regional economic landscapes will be emphasized. (Alt/yr)
Prereq: Geog 345 or Geog 350 or Permission of Instructor

Rationale: The course title and description update arise from incorporation of the previous material in a new course in economic geography (New Economic Spaces) and providing a necessary update and expansion of material for students of human geography. There is no other course like this offered at the university. Significant contributions to heterodox economic approaches in economic geography have been made recently by geographers such as David Harvey, Mike Webber, David Rigby, Neil Smith, Eric Sheppard, and Trevor Barnes and our students need to be fluent with their research. These new approaches are counter to and provide significantly different results than models and policies drawn from the neo-classical and orthodox economic perspectives. Increasingly, research requires these alternative perspectives for more effective and complete description of problems as well as unique solution frameworks. Geographical theories of development (Webber and Rigby), uneven geographical development (Smith and Harvey), and explaining spatial variations in trade flows and growth potential now require one or more of these perspectives. This course will fill a gap currently in our human geography curriculum.

Enrollment: Estimate approx. 10-20 undergraduate students of which 5-10 should be geography students and 3-8 political science/International Studies students per semester offered based on polls in the geography 365 course, faculty communications and geography graduate student response.

Teaching Load: Course to be alternated with Geography 350/550 and Geography 542 in the Spring semesters. It has been in the instructor’s (Ray Dezzani) rotation for several years but the last time it was offered it did not meet the minimum enrollment, possibly because it was too similar to other courses offered in other departments. The proposed changes make it more unique.

3. Change the curricular requirements of Geography (B.S.):

This program is offered through the College of Science. Required course work includes the university requirements (see regulation J-3) and:

Note: Students must earn a grade of "C" or better in all Geography courses.

Engl 313 Business Writing or
Engl 317 Technical Writing (3 cr)
Geog 100. Physical Geography and Lab (4 cr)
Geog 100L
Geog 165 Human Geography (3 cr)
Geog 200 World Regional Geography (3 cr)
Geog 313 Global Climate Change (3 cr)
Geog 385 GIS Primer (3 cr)
Geog 390 Cartographic Design & Geovisualization (3 cr)
Geog 493 Senior Capstone in Geography (3 cr)
Math 143 Pre-calculus Algebra and Analytic Geometry (3 cr)
Stat 251 Statistical Methods (3 cr)

One of the following (3-4 cr):
Math 143 Pre-calculus Algebra and Analytic Geometry (3 cr)
Math 160 Survey of Calculus (4 cr)
Math 170 Analytic Geometry and Calculus I (4 cr)
Math 175 Analytic Geometry and Calculus II (4 cr)

Students must also choose 3 credits from the following courses in human geography (3 cr):
Geog 240 Economic Geography (3 cr)
Geog 330 Urban Geography (3 cr)
Geog 340 Business Location Decisions (3 cr)
Geog 350 Geography of Development (3-4 cr)
Geog 360 Population Dynamics and Distribution (3-4 cr)
Geog 365 Political Geography (3 cr)
Geog 409 Rural Development (3 cr)
Geog 420 Land, Resources, and Environment (3 cr)
Geog 440 The New Global Economy (3 cr)

Student must also choose 3 credits from the following courses in physical geography (3 cr):
Geog 301 Meteorology (3 cr)
Geog 401 Climatology (3 cr)
Geog 410 Biogeography (3 cr)
Geog 430 Climate Change Ecology (3 cr)
Geog 412 Applied Meteorology and Climatology (3 cr)
REM 450 Global Environmental Change (3 cr)

Student must also choose 3 credits from the following courses in human-environment interactions (3 cr):
Geog 364 Idaho and the Pacific Northwest (3 cr)
Geog 411 Natural Hazards and Society (3 cr)
Geog 420 Land, Resources, and Environment (3 cr)
Geog 435 Climate Change Mitigation (3 cr)
Geog 455 Societal Resilience and Adaptation to Climate Change (3 cr)
Geog 491 Field Techniques (3 cr)

6 additional credits in Geography courses, for a total minimum number of 36 credits in Geography

Courses to total 120 credits for this degree

Students interested in obtaining more depth in any of the departmental focus areas (Geographic Information Science (GIS), spatial analysis, physical science and the environment, regional/global development) are encouraged to discuss with their advisor recommended courses in Geography and other departments appropriate to those depth areas.

Rationale: Change in 1st section is merely a housekeeping change to allow courses higher than Math 143 to meet requirement. Change in 3rd section removes courses not taught regularly and adds new course that has been taught twice in last three years.

4. Change the curricular requirements of Climate Change (Minor):

Geog 313 Global Climate Change (3 cr)
Choose two-three of the following courses (6-9 cr):
Geog 401 Climatology (3 cr)
Geog 430 Climate Change Ecology (3 cr)
Geog 435 Climate Change Mitigation (3 cr)
Geog 455 Societal Resilience and Adaptation to Climate Change (3 cr)
Geog 493 Senior Capstone in Geography (3 cr)

Choose one of the following courses (3 cr):
EnvS 497 Senior Research (3 cr)
Geog 493 Senior Capstone in Geography (3 cr)
REM 450 Global Environmental Change (3 cr)

An additional six credits chosen from the following (6 cr):
AgEc 451 Applied Environmental and Natural Resource Economics (3 cr)
AgEc 477  Law, Ethics, and Environment (3 cr)
CSS 383  Natural Resource and Ecosystem Service Economics (3 cr)
Econ 385  Environmental Economics (3 cr)
EDCI 329  Elementary Science Education (3 cr)
EDCI 433  Secondary Science Methods (3 cr)
EnvS 101  Introduction to Environmental Science (3 cr)
EnvS 225  International Environmental Issues Seminar (3 cr)
EnvS 438  Western US Water Resource Policy and Environmental Equity (3 cr)
EnvS 483 or EnvS 583  Water and Energy Systems (3 cr)
EnvS 484  History of Energy (3 cr)
EnvS 485  Energy Efficiency and Conservation (3 cr)
For 221  Ecology (3 cr)
For 235  Society and Natural Resources (3 cr)
For 326  Fire Ecology and Management (3 cr)
For 330  Forest Soil and Canopy Processes (4 cr)
For 426  Global Fire Ecology and Management (3 cr)
For 462  Watershed Science and Management (3 cr)
Geog 100, 100L  Physical Geography and Lab (4 cr)
Geog 301  Meterology (3 cr)
Geog 345  Global Economic Geography (3 cr)
Geog 350  Geography of Development (3-4 cr)
Geog 410  Biogeography (3 cr)
Geog 411  Natural Hazards and Society (3 cr)
JAMM 341  Mass Media Ethics (3 cr)
JAMM 428  Environmental Journalism (3 cr)
REM 221  Ecology (3 cr)
REM 429  Landscape Ecology (3 cr)
Soil 205  The Soil Ecosystem (3 cr)

Courses to total 18 credits for this minor

Rationale: Due to staffing changes, the second and third sections of the existing requirements listed below (“choose two” and “choose one”) have become bottlenecks for students earning the minor. We seek to combine those two sections into one combined section from which students must “choose three” courses. We are also adding two courses to the combined menu (one new one in our department, taught previously as a 404 and one new one in another department). We would also like to make some additions and deletions to the list of eligible courses for the last section (Additional credits, 6 cr)/cc

5. Change the curricular requirements of **Geography information Systems** (UG Academic Certificate):

   **Note:** A grade of ‘C’ or higher is required in all coursework for this academic certificate.

   Geog 385  GIS Primer (3 cr)
   Geog 475  Intermediate GIS (3 cr)
   Electives (9 cr)
   Geog 390  Cartographic Design & Geovisualization (3 cr)
   Geog 407 or Geog 507  Spatial Analysis and Modeling (3 cr)
   Geog 424  Hydrologic Applications of GIS and Remote Sensing (3 cr)
   Geog 524  Remote Sensing/GIS Integration (3 cr)
   Geog 483 or Geog 583  Transportation, GIS and Planning (3 cr)
   Geog 486  GIS Programming (3 cr)
   Geog 479  Advanced Topics in Remote Sensing (3 cr)

   **Courses to total 15 credits for this certificate**

   Rationale: Correcting type/error that cropped into 2012 and later catalogs, in which Geog 507 was inadvertently removed from the list of eligible electives for the GIS Certificate.
Mathematics

1. Add the following subject prefix:

MthE – Mathematics Education

Rationale: The Math Department would like to create a new prefix for Mathematics Education courses “MTHE”. Because of the new endorsement required by the state for K-12 teachers of mathematics, we will need to add a several courses to our curriculum in addition to the mathematics education courses that already exist. The addition of these new courses complicates the curriculum and degree audit for current math degree options. Having a separate prefix for the mathematics education courses will assist students in locating the courses in the catalog and time schedule as well as make the existing math options cleaner in the catalog and degree audit.

2. Add the following courses:

**Math 427** Transformational Geometry (3 cr)
See MthE 527.

Rationale: See MthE 527

**MthE 527** Transformational Geometry (3 cr)
Same as Math 427. Geometry concepts of congruence, parallelism, and similarity using rigid motions; the group structure of the collection of isometries and their matrix representations. For graduate credit, additional transformational approaches for calculus integration strategies are required. The course is of particular interest to secondary mathematics teaching majors.

**Prereq:** Math 330 or equivalent

Rationale:
Motivation for the course for high school teachers: Common Core State Standards for Mathematics (CCSSM-M, 2010) asserts that students will experiment with transformations in the plane and understand congruence in terms of rigid motions. Similar statements are made for similarity. These standards have been adopted by the State of Idaho and are now the required content for school mathematics. Traditional secondary teacher preparation has focused on Euclidean geometry, with systematic treatment of analytic geometry occurring primarily in traditional calculus. This training is insufficient for middle school and secondary teachers, who must navigate transformational geometry as prescribed by Common Core. Transformational geometry depends heavily on several fields of mathematics traditionally viewed as separate from school geometry including matrix theory and abstract algebra.

Motivation for the course for community college teachers: Community colleges often teach second and third semester calculus and linear algebra. This course will strengthen future teachers’ preparation to teach calculus by giving careful attention to transformational geometry and its applications to change of variables in integration problems. This course will also strengthen future teachers’ preparation for teaching linear algebra by giving careful attention to uses of matrices (e.g., applications of matrix theory and matrix representations with respect to the basis chosen).

Additional motivation for the course: In transformational geometry, the investigative mode through which students recognize a property/theorem is very closely related to the theorems and axioms they appeal to when it comes time to prove the property/theorem. In Euclidean geometry this is often not the case—-a theorem that is discovered by investigation with transformations is proven with other things like the SAS theorem or postulate.

This course will not add to the workload as we have been offering and plan to continue to offer it as part of our summer course offerings. The instructor will be paid by funds generated by summer fees.

3. Change the following courses:

**Math MthE 235** Mathematics for Elementary Teachers I (3 cr)
Mathematical development of arithmetic and problem solving as those subjects are currently taught in elementary schools. Three lec and one 1-hr lab a wk.

**Prereq:** Math 137 or Math 143 or sufficient score on SAT, ACT, or COMPASS Math Test.

Rationale: Change the prefix of the course to MTED and place it under the new prefix for Mathematics Education Courses as it is a Mathematics Education course.

**Math MthE 236** Mathematics for Elementary Teachers II (3 cr)
Mathematical development of informal geometry, problem solving, and probability and statistics as those subjects are currently taught in elementary schools. Three lec and one 1-hr lab a wk.

**Prereq:** Math 235

Rationale: Change the prefix of the course to MTED and place it under the new prefix for Mathematics Education Courses as it is a Mathematics Education course.
**Math MthE 301 Early Childhood Mathematics (4 cr)**
Focus on the mathematics for early childhood: numbers and operations, algebraic thinking, geometry, measurement, probability and statistics. Emphasis will be placed on reasoning, representation, connections and communication. This course is restricted to students from either the School of Family and Consumer Sciences or the College of Education. This course will not count as a 300-level mathematics course in any major or minor in the College of Science. Recommended preparation: Stat 150. (Fall Only)
Prereq: One general education math course

Rationale: Change the prefix of the course to MTED and place it under the new prefix for Mathematics Education Courses as it is a Mathematics Education course.

**Math MthE 303 Early Childhood Math I (2 cr)**
Focus on the mathematics of early childhood: numbers and operations. Emphasis is placed on reasoning, representation, connections and communication. This course is restricted to students from either the School of Family and Consumer Sciences or the College of Education. This course will not count as a 300-level mathematics course in any major or minor in the College of Science. Recommended preparation: general education math core.

Rationale: Change the prefix of the course to MTED and place it under the new prefix for Mathematics Education Courses as it is a Mathematics Education course.

**Math MthE 304 Early Childhood Math II (2 cr)**
Focus on the mathematics of early childhood: algebraic reasoning, geometry, measurement, probability and statistics. Emphasis is placed on reasoning, representation, connections and communication. This course is restricted to students from either the School of Family and Consumer Sciences or the College of Education. This course will not count as a 300-level mathematics course in any major or minor in the College of Science. Recommended preparation: general education math core.

Rationale: Change the prefix of the course to MTED and place it under the new prefix for Mathematics Education Courses as it is a Mathematics Education course.

**Math 388 History of Mathematics (3 cr)**
Same as Hist 388. History of the development of mathematical ideas from ancient cultures to the present, including the relationship of those ideas to the cultures that produced them as well as an understanding of the mathematics involved. Cooperative: open to WSU degree-seeking students.

Prereq: Math 175 and 330; or Permission

Rationale: The current prerequisites are Math 175 and Math 330; or permission. Math 330 was originally required because it assured some degree of mathematical maturity. However, Math 330 (Linear Algebra) has never been discussed in Math 388 to date and the current instructor finds it unnecessary to require Math 330 as a prerequisite.

**Math J453/J538 Stochastic Models (3 cr)**
Same as Stat J453/J544. Markov chains, stochastic processes, and other stochastic models; applications. Additional projects/assignments reqd for grad cr. Cooperative: open to WSU degree-seeking students. (Spring, Alt/ys)
Prereq: Math 451 or Permission

**Math MthE 513 Problem Solving Through History (3 cr)**
Historical study of approaches to solving problems in geometry, number theory, and set theory. This course is specifically designed for the MAT program, and will not satisfy the requirements of other mathematics degree programs.

Rationale: Change the prefix of the course to MTED and place it under the new prefix for Mathematics Education Courses as it is a Mathematics Education course.

**Math MthE 514 Foundations of Calculus (3 cr)**
Real numbers, sequences, topology of the real numbers, continuous functions, differentiation, and integration; emphasis on developing the conceptual understanding needed to teach calculus in secondary school. This course is specifically designed for the MAT program, and will not satisfy the requirements of other mathematics degree programs.

Rationale: Change the prefix of the course to MTED and place it under the new prefix for Mathematics Education Courses as it is a Mathematics Education course.

**Math MthE 515 Problems in Geometry (3 cr)**
Exploration of topics in geometry with emphasis on developing geometric reasoning and problem solving. This course is specifically designed for the MAT program, and will not satisfy the requirements of other mathematics degree programs.

Rationale: Change the prefix of the course to MTED and place it under the new prefix for Mathematics Education Courses as it is a Mathematics Education course.
**Math MthE 516** Groups and Symmetry (3 cr)
Exploration of groups, symmetry, and permutations. This course is specifically designed for the MAT program, and will not satisfy the requirements of other mathematics degree programs.

Rationale: Change the prefix of the course to MTED and place it under the new prefix for Mathematics Education Courses as it is a Mathematics Education course.

**Math MthE 590** Seminar in Math Education (1-3 cr, max arr)
Topics in Mathematics Education. May be repeated for credit. Cooperative: open to WSU degree-seeking students.

Rationale: Change the prefix of the course to MTED and place it under the new prefix for Mathematics Education Courses as it is a Mathematics Education course.

**Physics**

1. Drop the following courses:

   **Phys 301** Junior Physics Lab (2 cr)
   Experimental techniques in modern physics, including optics, atomic, nuclear, and solid state physics; computer uses, error analysis, and scientific literature searches. One 1-hr lec and one 3-hr lab a wk. (Spring only)
   **Prereq:** Phys 213/213L or Permission
   
   Recommended Course Equivalent: None
   
   Rationale: PHYS 301 has not been taught for at least eight years. The Department has changed the content in PHYS 411 to meet the current laboratory practices in the field and students are encouraged to take PHYS 490 working one on one in a professor’s research program. Doing this will gain more relevant research experience than would be possible in 301.

   **Phys 412** Physical Instrumentation II (3 cr)
   Methods and instruments used in experimental physics; electronic techniques; design problems in electronic measurement of physical quantities encountered in research. Two lec and one 3-hr lab a wk.
   **Prereq:** Phys 411
   
   Recommended Course Equivalent: None
   
   Rationale: PHYS 412 has not been taught for at least eight years. The Department has changed the content in PHYS 411 to meet the current practices in the field and PHYS 412 is no longer needed.

2. Add the following courses:

   **Phys 407** Communicating Science (1 cr)
   Writing scientific abstracts, manuscripts, and grant proposals; peer review; presenting concepts to scientists in oral and poster form; communicating to non-scientists.
   **Prereq:** Junior or Senior Standing
   
   Rationale: Senior Experience. Taught once per year. Enrollment estimate: 10. Will increase overall teaching load of the department by 1 cr per year. The department can handle this, because it hired two new faculty during the present and past year.

   **Phys J438/J538** Biological Physics (3 cr)
   Physics principles applied to biological systems including organisms, cells, and biomolecules. Techniques for studying biological systems and phenomena. Additional projects/assignments required for graduate credit.
   **Prereq for Phys 438:** Phys 212 or Phys 213; and Junior or Senior Standing
   **Prereq for Phys 538:** Graduate Standing or Permission
   
   Rationale: Biophysics is an emerging field of research in the physics department. Will be taught about once per year. Enrollment estimate: 10. Will increase overall teaching load of the department by about 3 cr per year. The department can handle this, because it hired two new faculty during the present and past year, one of them a biophysicist.

   **Phys 492** Senior Research (1 cr)
   Undergraduate research in one of the department focus areas. Scientific communication through one presentation to the scientific community and one written report.
   **Prereq:** Junior or Senior Standing; or Permission of Instructor
   
   Rationale: Senior Experience*. Will not increase overall teaching load of the department because undergraduate research has continuously been taught in the past.

   *Editor’s Note: Phys 492 has not been approved by UCGE (as of 11/5/14) as a Senior Experience course.
3. Change the following courses:

**Phys 200** (s) Physics Seminar (1 cr, max. 8)
Introductory-level discussion of topics in modern physics; introduction to physics research topics and scientific information search techniques; written and/or oral reports of a pertinent topic in current physics. (Fall only)
Rationale: Corrects catalog entry: PHYS 200 is a 1 credit class.

**Phys 211L** Engineering Physics I Lab (1 cr)
Kinematics and dynamics, Newton's laws, work and energy, rotational dynamics, linear and angular momentum, collisions, static equilibrium, oscillations, gravity and central forces. Three lec, one recitation, and one 2-hr lab a wk.
Prereq or Coreq: Math 170 Phys 211
Rationale: Corrects catalog entry: PHYS 211L is a 1 credit lab class; lecture is a separate class

**Phys 212L** Engineering Physics II Lab (1 cr)
Electric fields and potentials, magnetic fields, capacitance and inductance, DC and AC circuits, electromagnetic waves. Three lec, one recitation, and one 2-hr lab a wk.
Prereq or Coreq: Math 175 Phys 212
Rationale: Corrects catalog entry: PHYS 212L is a 1 credit lab class; lecture is a separate class.

**Phys 213L** Engineering Physics III Lab (1 cr)
Fluid dynamics, waves in elastic media, sound waves, temperature, heat and thermodynamics, kinetic theory, geometric and physical optics. Three lec, one recitation, and one 2-hr lab a wk. (Spring only)
Prereq: Phys 211L/211L
Prereq or Coreq: Math 175 Phys 213
Rationale: Corrects catalog entry: PHYS 213L is a 1 credit lab class; lecture is a separate class.

**Phys 321** Analytical Mechanics (3 cr)
Review of single-particle kinematics and dynamics; linear oscillations; Lagrangian dynamics; orbital dynamics; motion in non-inertial systems; space rotation of rigid bodies; Kinematics and dynamics of particles; oscillating systems; dynamics of the rigid body.
Prereq: Phys 212/212L and Math 275
Rationale: The new description is more accurate.

**Phys 322** Analytical Mechanics (3 cr)
Advanced topics in theoretical mechanics which may include: coupled linear oscillators; transition to a continuous system (vibrating string); Hamiltonian dynamics; non-linear dynamics; Principle of least action, dynamics of systems of particles, theory of oscillations, mechanics of continuous media.
Prereq: Phys 321
Rationale: The new description is more flexible which is more appropriate for part two of Analytical Mechanics.

**Phys 341** Electromagnetic Fields I (3 cr)
This course is designed to provide undergraduate physics majors advanced instruction in electrostatics. The specific areas which will be covered are electric fields, electric potentials, work and energy in electrostatics, the technique of using the concept of image charges to solve for the electric field and electric potential of complex charge distributions, Laplace's and Poisson's equations, electric dipoles, polarization and polarizable materials, and the electric dipole approximation. Theory using vector calculus; electrostatics; magnetostatics; electromagnetism, analysis of AC and DC circuits; Maxwell's equations; radiation and propagation of electromagnetic waves.
Prereq: Phys 212/212L and Math 275
Rationale: Corrects catalog entry with more appropriate description and prerequisites.

**Phys 342** Electromagnetic Fields II (3 cr)
This course is designed to provide undergraduate physics majors advanced instruction in electrodynamics and magnetism. The specific areas that will be covered are magneto-statics, magnetic fields in matter, the vector potential, electrodynamics, the complete set of Maxwell's equations, electromagnetic waves, waveguides, electric and magnetic dipole radiation, retarded and advanced potentials, and radiation arising from accelerated charges and charge distributions. Theory using vector calculus; electrostatics; magnetostatics; electromagnetism, analysis of AC and DC circuits; Maxwell's equations; radiation and propagation of electromagnetic waves.
Prereq: Phys 341
Phys 411  **Physical Instrumentation**  [Advanced Physics Lab (3-4 cr)]
Research skills, group dynamics, scientific literature research/drafting, automation and design techniques to prepare students for post-graduate life in a physics laboratory setting. 1-hr distributed lecture time and 3-hr effective lab time per week. Some weeks require scheduling machine utilization time outside of standard class hours per student. Methods and instruments used in experimental physics; electronic techniques; design problems in electronic measurement of physical quantities encountered in research. Two 3-credit one 3-hr lab a wk.  
Prereq:  [Phys 212/212L, Phys 213, Math 275](Phys 535/537)

Rationale: PHYS 411 has been updated to better address real world problems and current practice in Physics laboratories.

**Phys 433/533  Statistical Thermodynamics (3 cr)**  
Phys 433 same as Chem 495. Classical thermodynamics, entropy, thermodynamic potentials, kinetic theory, classical and quantum statistical mechanics, ensembles, partition functions, introduction to phase transitions. [Additional assignments required for graduate credit.](Chem 306/406)

Prereq: Chem 306 or Phys 305 or equivalent

Rationale: PHYS 533 has been updated to reflect current trends in statistical thermodynamics. Graduate course has been separated from the UG course (433), so content can be tailored to appropriate student level.

**Phys 490  Research (1-6 cr, max 6)**  
Undergraduate research or thesis.  
Prereq: Junior standing in physics and Permission of department/Permission of Instructor

Rationale: Most of the time, Phys 490 is used for undergraduate research without thesis. The permission should be up to the instructor and not the department. Undergraduate research can be done in any year of undergraduate studies.

**Phys 533  Statistical Mechanics**  [Thermodynamics (3 cr)]  
Ensembles, partition functions, classical and quantum statistics, renormalization group, criticality, scaling, interacting systems, simulation. Compatible to WSU degree-seeking students. See Phys 433/533.  
Prereq: Phys 333

Rationale: PHYS 533 has been updated to reflect current trends in statistical thermodynamics. Graduate course has been separated from the UG course (433), so content can be tailored to appropriate student level.

Coop Rationale: Support partnership with WSU.

**Phys 541  Electromagnetic Theory I (3 cr)**  
Analytical tools and techniques describing electromagnetic phenomena, particularly Maxwell’s equations, electrostatic and magnetostatic systems, including currents and their interactions and boundary value problems. Includes Maxwell’s equations, electrostatics, magnetostatics, currents and their interactions, general theory of emission, propagation and absorption of electromagnetic waves, boundary value problems, relativistic formulation of electrodynamics. Cooperative: open to WSU degree-seeking students.  
Prereq:  [Phys 322, Phys 342](322,342)

Rationale: Clarifies difference between PHYS 541 & PHY 542; previously the catalog descriptions were identical.

**Phys 542  Electromagnetic Theory II (3 cr)**  
Further examinations of the analytical tools and techniques that describe electromagnetic phenomena, particularly electrodynamics, the general theory of emission, propagation and absorption of electromagnetic waves, and the relativistic formulation of electrodynamics. Includes Maxwell’s equations, electrostatics, magnetostatics, currents and their interactions, general theory of emission, propagation and absorption of electromagnetic waves, boundary value problems, relativistic formulation of electrodynamics. Cooperative: open to WSU degree-seeking students.  
Prereq:  [Phys 322, Phys 342](322,342,541)

Rationale: Clarifies difference between PHYS 541 & PHY 542; previously the catalog descriptions were identical.

**Phys 550  Quantum Mechanics I (3 cr)**  
Fundamental concepts, base kets and matrix representation, position and momentum space; Schroedinger and Heisenberg picture. Schroedinger’s wave equation and solutions; theory of angular momentum. Physical basis; Schroedinger wave formulation, Heisenberg matrix formulation, transformation theory, approximation methods, radiation theory, theory of scattering; application to atomic systems. Cooperative: open to WSU degree-seeking students.  
Prereq:  [Phys 305, Phys 322, Phys 351](305,322,351)

Rationale: Clarifies difference between PHYS 550 & PHY 551; previously the catalog descriptions were identical.
Phys 551  Quantum Mechanics II (3 cr)
Theory of angular momentum continued; symmetries in quantum mechanics; approximation methods, time-dependent and time-
independent perturbation theory, applications to atomic systems; radiation theory, theory of scattering. Physical basis; Schroedinger
wave formulation, Heisenberg matrix formulation, transformation theory, approximation methods, radiation theory, theory of
scattering; application to atomic systems. Cooperative: open to WSU degree-seeking students.
Prereq: Phys 305, Phys 322, Phys 550

Rationale: Clarifies difference between PHYS 550 & PHY 551; previously the catalog descriptions were identical.

4. Change the curricular requirements of Physics (B.S.):

Required course work includes the university requirements (see regulation J-3) and:

Chem 111  Principles of Chemistry I (4 cr)
Chem 112  Principles of Chemistry II (5 cr)
Math 170  Analytic Geometry and Calculus I (4 cr)
Math 175  Analytic Geometry and Calculus II (4 cr)
Math 275  Analytic Geometry and Calculus III (3 cr)
Phys 200  Physics Seminar (1 cr)
Phys 211, Phys 211L  Engineering Physics I and Lab (4 cr)
Phys 212, Phys 212L  Engineering Physics II and Lab (4 cr)
Phys 213, Phys 213L  Engineering Physics III and Lab (4 cr)
Phys 305  Modern Physics (3 cr)
Phys 321  Analytical Mechanics (3 cr)
Phys 341  Electromagnetic Fields I (3 cr)
Phys 351  Introductory Quantum Mechanics I (3 cr)

And one of the following emphases:

A. General Physics Emphasis
Phys 342  Electromagnetic Fields II (3 cr)
Phys 371  Mathematical Physics (3 cr)
Phys 433  Statistical Thermodynamics (3 cr)

Upper-division mathematics electives (6 cr)
Physics elective courses numbered 400 or above (15 cr including at least 4 cr of lab and 9 cr of non-lab courses)

Upper-division physics courses, including at least 4 cr of lab and 9 cr from the following: Phys 411, Phys 412, Phys 425, Phys 428,
Phys 443, Phys 444, Phys 464, Phys 465, and Phys 484 (at least 15 cr).

Courses to total 120 credits for this degree

B. Applied Physics Emphasis
Math 310  Ordinary Differential Equations (3 cr)
Math 330  Linear Algebra (3 cr)
Phys 411  Advanced Physics Lab (4 cr) Physical Instrumentation I (3 cr)

Four credits of upper-division lab work in physics and engineering

Physics and engineering electives (27 cr, of which at least 21 credits must be upper-division and at least 9 credits must be 400-
level and 21 credits must come from the following: ECE 350 + ECE 351, ECE 460, ECE 462, Engr 210, Engr 240, Engr 335, Engr
350, ME 301, ME 412, ME 413, ME 420, MSE 201, MSE 313, MSE 427, MSE 464, Phys 333, Phys 428, Phys 433, Phys 443, Phys
444, Phys 464, Phys 490, Phys 491.)

Courses to total 120 credits for this degree

Rationale: Number for Statistical Thermodynamics course updated The new description of the elective requirements is simple and
clear. They do not require changes when new electives are added to the physics program. Number for the Thermodynamics course
updated, MSE 464, Phys 464, 490 and 491 added.
1. Change the status of the following courses from dormant to active:

   **Stat J453/J544 Stochastic Models (3 cr)**
   See Math J453/J538.
   
   Rationale: We are resurrecting a dormant course that is cross-listed with Math and is currently be staffed by them as well. It was an oversight on our part to let it go dormant.

2. Add the following course:

   **Stat 525 Master’s Econometrics (3 cr)**
   Same as AgEc 525.
   
   Rationale: We are simply cross-listing a course that is being staffed by CALS. We wanted to cross-list it so that students could apply it more easily to the Graduate Certificate in Statistics. This course was dropped by Statistics 10+ years ago, but we are now resurrecting it.

3. Change the following courses:

   **Stat 251 Statistical Methods (3 cr)**
   Credit not awarded for Stat 251 after Stat 301 or Stat 416, or for Stat 416 after Stat 251 or Stat 301 Credit awarded for only one of Stat 251, Stat 301, and Stat 416. Intro to statistical methods including design of statistical studies, basic sampling methods, descriptive statistics, probability and sampling distributions; inference in surveys and experiments, regression, and analysis of variance.
   
   **Prereq:** One of the following: Math 108, Math 137, Math 143, Math 160, Math 170, or Sufficient score on SAT, ACT, or COMPASS Math Test to qualify for registration in Math 130
   
   Rationale: Statistic 301 is calculus-based, whereas Stat 251 and Stat 416 are at the pre-calculus level, and so there is not so much overlap between the courses at the technical level. Statistics 301 also covers significantly more probability theory than Stat 251 or Stat 416. The opinion of the faculty is that students should receive credit for Stat 301 even if they have already taken Stat 251 or Stat 416.

   **Stat 301 Probability and Statistics (3 cr)**
   Credit not awarded for Stat 251 after Stat 301 or Stat 416, or for Stat 416 after Stat 251 or Stat 301 Credit awarded for only one of Stat 251, Stat 301, and Stat 416. Intended for engineers, mathematicians, and physical scientists. Intro to sample spaces, random variables, statistical distributions, hypothesis testing, basic experimental design, regression, and correlation.
   
   **Prereq:** Math 175
   
   Rationale: Statistic 301 is calculus-based, whereas Stat 251 and Stat 416 are at the pre-calculus level, and so there is not so much overlap between the courses at the technical level. Statistics 301 also covers significantly more probability theory than Stat 251 or Stat 416. The opinion of the faculty is that students should receive credit for Stat 301 even if they have already taken Stat 251 or Stat 416.

   **Stat 416 Statistical Methods for Research (3 cr)**
   Credit not awarded for Stat 251 after Stat 301 or Stat 416, or for Stat 416 after Stat 251 or Stat 301 Credit awarded for only one of Stat 251, Stat 301, and Stat 416. Concepts and methods in quantitative research including observational and experimental study design, point estimation, hypothesis testing, effect size, sample size, causation, one and two-way ANOVA, simple linear regression, interpreting and reporting results.
   
   **Prereq:** One of the following: Math 108, Math 137, Math 143, Math 160, Math 170, or Sufficient score on SAT, ACT, or COMPASS Math Test to qualify for registration in Math 130 Math 137, Math 143, Math 160, Math 170, or two years of high school algebra and permission
   
   Rationale: Statistic 301 is calculus-based, whereas Stat 251 and Stat 416 are at the pre-calculus level, and so there is not so much overlap between the courses at the technical level. Statistics 301 also covers significantly more probability theory than Stat 251 or Stat 416. The opinion of the faculty is that students should receive credit for Stat 301 even if they have already taken Stat 251 or Stat 416. The change to the prereqs is to make the course consistent with Stat 251. Both courses should have the same prereqs. The change was made earlier to Stat 251 but was not submitted for Stat 416.

   **Stat 422 Sample Survey Sampling Methods (3 cr)**
   Introduction to survey sampling designs and inference including simple, stratified, and cluster sampling; ratio and regression estimators, unequal probability sampling, and population size estimation. Simple random, systematic, stratified random, one and two stage cluster sampling; introduction to variable probability sampling and estimation of population size. Two lec and one 1-hr lab a week.
   
   **Prereq:** Stat 251 or Stat 301 or Stat 416
   
   Rationale: The change to the prereqs is to make the course consistent with Stat 251. Both courses should have the same prereqs. The change was made earlier to Stat 251 but was not submitted for Stat 416.
Rationale: The change in the course title and description is simply to bring it up to date with how survey sampling is currently discussed in the literature. We are also adding Stat 416 as a prereq because it is also a sufficient introduction to the statistical theory for the course.

**Stat 426 SAS Programming (3 cr)**
Coverage of a variety of methods for data manipulation, data management, and programming in the SAS language. DATA step programming methods including data transformation, functions for numeric and character data, input of complicated data files, and do loop usage. Data management topics include concatenating data files, sorting and merging data files and ARRAY statement usage. SAS programming with SAS modules such as SAS/Graph, SAS/IML, and SAS/Macro language. Other topics in SAS programming, such as covering other SAS modules in depth.

*Prereq:* Stat 251 or Stat 301 or Stat 416

Rationale: Statistics 416 provides a sufficient introduction to statistical theory and methods for the SAS Programming course.

4. Change the curricular requirements of **Statistics (Minor):**

| Stat 422 | Sample Survey Sampling Methods (3 cr) |
| Stat 431 | Statistical Analysis (3 cr) |

One of the following (4 cr):

| Math 160 | Survey of Calculus (4 cr) |
| Math 170 | Analytic Geometry and Calculus (4 cr) |

One of the following (3 cr):

| Stat 251 | Statistical Methods (3 cr) |
| Stat 301 | Probability and Statistics (3 cr) |

Three of the following courses (9 cr):

| Bus 421 | Marketing Research and Analysis (3 cr) |
| Math 330 | Linear Algebra (3 cr) |
| Math 451 | Probability Theory (3 cr) |
| Math 452 | Mathematical Statistics (3 cr) |
| Stat 433 | Econometrics (3 cr) |
| Stat 546 | Quality Management (3 cr) |
| Stat 514 | Nonparametric Statistics (3 cr) |
| Stat 519 | Multivariate Analysis (3 cr) |

**Courses to total 20-22 credits for this minor**

Rationale: Fixing an error in the number of credits.