COLLEGE OF SCIENCE
Proposed Catalog Changes

Biological Sciences

1. Drop the following courses [Effective: Summer 2014]

   **Biol 590 Teaching Practicum (2 cr)**
   Same as MMBB 590. Teaching by master’s students under faculty supervision.
   **Prereq:** Permission
   
   Recommended Equivalent Course: Biol 521
   
   Rationale: Biol 590 Teaching Practicum was created simply to be a cross-listed BIOL course with MMBB 590, which is being dropped and replaced by Biol 521 Graduate Teaching Practicum. This is part of the process of harmonizing the graduate degree curricular requirements within Biological Sciences.

   **Biol 591 Teaching Practicum (2 cr, max 4)**
   Same as MMBB 591. Teaching by Ph.D. students under faculty supervision.
   **Prereq:** Permission
   
   Recommended Equivalent Course: Biol 521
   
   Rationale: Biol 591 was created simply to be a cross-listed BIOL course with MMBB 591, which is being dropped and replaced by Biol 521 Graduate Teaching Practicum. This is part of the effort to harmonize the graduate degree curricular requirements within Biological Sciences.

   **MMBB 300 Survey of Biochemistry (3 cr)**
   See Biol 300.

   **MMBB 380 Introductory Biochemistry (4 cr)**
   See Biol 380.

   **MMBB 382 Introductory Biochemistry Laboratory (2 cr)**
   See Biol 382.

   **MMBB 589 Advanced Topics in Molecular Biology, Microbiology and Biochemistry (2 cr, max 4)**
   Recent research in enzymes, hormones, complex lipids, vitamins, nucleic acids, antibiotics, viruses, and MMBB genetics.
   **Prereq:** Permission
   
   Rationale: MMBB 589 Advanced Topics in Microbiology, Molecular Biology and Biochemistry was used as the qualifying exam for MMBB PhD students. Qualifying exam procedures for the MMBB Ph.D. are now being harmonized with the Biology Ph.D., which does not use a formal course. MMBB 589 is no longer a required course for MMBB Ph.D. or M.S. students. We are therefore eliminating MMBB 589. This course is no longer being offered and has not been taught for two years.

   **MMBB 590 Teaching Practicum (2 cr)**
   See Biol 590.
   
   Recommended Equivalent Course: Biol 521
   
   Rationale: MMBB 590 Teaching Practicum is being dropped and replaced by Biol 521 Graduate Teaching Practicum as a means of harmonizing the graduate degree curricular requirements within Biological Sciences.

   **MMBB 591 Teaching Practicum (2 cr, max 4)**
   See Biol 591.
   
   Recommended Equivalent Course: Biol 521
   
   Rationale: MMBB 591 Teaching Practicum is being dropped and replaced by Biol 521 Graduate Teaching Practicum as a means of harmonizing the graduate degree curricular requirements within Biological Sciences.

2. Add the following courses [Effective: Summer 2014]

   **Biol 315 Genetics Lab (1 cr)**
Laboratory on genetic mechanisms in animals, plants, and microorganisms. One three hr. lab per wk.

**Prereq:** Biol 115 or Biol 250  
**Coreq:** Biol 310

**Rationale:** The lab component of this course is being separated from the lecture to increase student scheduling flexibility. We are currently experiencing enrollment constraints because the lab can only accommodate 24 students per section (based on the maximum occupancy of the lab room). Students who only need the lecture portion of the class (non majors) could enroll in the lecture portion only, which would free lab space.

**Biol 324 Comparative Vertebrate Anatomy (4 cr)**

Evolution of vertebrates and their organ systems with an emphasis on structure – function relationships. Two lectures and two 3-hour labs a week. (Fall only, alt/yr)

**Prereq:** Biol 115, Biol 116, and Biol 213; or Permission

**Rationale:** Comparative Vertebrate Anatomy is a fundamental upper division elective in the majority of top tier Evolutionary and Organismal Biology programs in the United States and a suggested elective for pre-medical, pre-dental and pre-veterinary students. Adding this course will expand the upper division electives offered in Biological Sciences and will attract students interested in organismal biology and health related fields. The cooperative agreement to offer this course at WSU has become ineffective due to the loss of public transportation.

3. **Change the following courses** [Effective: Summer 2014]

**Biol 101 Perspectives in Biology (1 cr)**

Open only to majors. Intro to the disciplines in the fields of biology; current research topics.  
**Graded P/F**. (Fall only)

**Rationale:** This course will be changed from graded P/F to a letter grade.

**Biol 310 Genetics (4-3 cr)**

Genetic mechanisms in animals, plants, and microorganisms. Three **hours of lec** per and one 3-hr lab a wk. (Fall only)

**Prereq:** Biol 115 or MMBB Biol 250

**Rationale:** The lab component of this course is being separated from the lecture to increase student scheduling flexibility. We are currently experiencing enrollment constraints because the lab can only accommodate 24 students per section (based on the maximum occupancy of the lab room). Students who only need the lecture portion of the class (non majors) could enroll in the lecture portion only, which would free lab space.

**Biol 300 Survey of Biochemistry (3 cr)**

Same as MMBB 300. Carries no credit after MMBB 380/Biol 380. Survey of biochemical principles and the molecular structure and function that describe the chemical basis of life, structure, function, and metabolism of major constituents of living systems. (Fall and Summer only)

**Prereq:** Chem 101 or Chem 111  
**Coreq:** Chem 275 or Chem 277

**Rationale:** This course was transferred to Biological Sciences when all the MMBB majors (and their inherent courses) were incorporated into the aforementioned department. This change is being made to correctly identify this course as belonging to Biological Sciences.

**Biol 380 Introductory Biochemistry/ Biochemistry I (4 cr)**

Same as MMBB 380. Carries one credit after MMBB 300/Biol 300. Introduction to the structure and function of major molecular constituents of living systems. Emphasis on proteins, enzyme kinetics and catalysis, carbohydrate metabolism. Three hrs lecture and one hr with interactive problem solving. (Fall only) Introduction to the structure, function, and metabolism of major constituents of living systems. Three hrs lec and one hr with interactive problem solving. Recommended preparation: Chem 253, Chem 254 and Chem 372. (Fall and Summer only)

**Prereq:** Chem 101 or Chem 111  
**Coreq:** Chem 275 or Chem 277

**Rationale:** This course was transferred to Biological Sciences when all the MMBB majors (and their inherent courses) were incorporated into the aforementioned department. This change is being made to correctly identify this course as belonging to Biological Sciences. The rationale for changing the prerequisites is that all of the majors that currently require MMBB 380 also require their students to take CHEM 112 in addition to CHEM 277; CHEM 112 exposes students to chemical calculations that are foundational to the calculations encountered in MMBB 380.

**Biol 382 Introductory Biochemistry/ Biochemistry I Laboratory (2 cr)**

Same as MMBB 382. Lab training in modern methods. One 3-hr lab and one 1-hr recitation a wk. (Fall only)

**Prereq:** Chem 101 or Chem 111; and Chem 278  
**Coreq:** Biol 380 or equivalent

**Rationale:** This course was transferred to Biological Sciences when all the MMBB majors (and their inherent courses) were incorporated into the aforementioned department. This change is being made to correctly identify this course as belonging to Biological Sciences.
Biological Sciences.

**MMBB Biol 250 General Microbiology (3 cr)**
*May be used with MMBB Biol 255 as general education credit in J-3-b. Same as FS 250.* Introduction to nature and activity of bacteria and other microorganisms; their importance in all life systems. Three hrs of lec per wk. (Fall only)

**Prereq:** Chem 101 or Chem 111

Rationale: This course was transferred to Biological Sciences when all the MMBB majors (and their inherent courses) were incorporated into the aforementioned department. This change is being made to correctly identify this course as belonging to Biological Sciences.

**MMBB J442/J542Biol J454/J554 Advanced Biochemistry II (3 cr)**
*Same as FS J442/J542, MMBB Biol 554.* Intermediate biochemistry; areas of emphasis include molecular biology, nitrogen and lipid metabolism, molecular physiology, and molecular biology. Extra oral and/or written assignments required for grad credit. (Spring only)

**Prereq:** Chem 372; MMBB 380 or Chem 302 or Chem 306; or Permission

Rationale: This course was transferred to Biological Sciences when all the MMBB majors (and their inherent courses) were incorporated into the aforementioned department. This change is being made to correctly identify this course as belonging to Biological Sciences.

4. **Change the curricular requirements of Biology (B.A. or B.S.)** [Effective: Summer 2014]

To graduate in this program, students must earn a minimum grade of C in 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 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** Genetics (4-3 cr)
- **Biol 315** Genetics Lab (1 cr)
- **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 411** Senior Capstone (2 cr)
- **Biol 421** Advanced Evolutionary Biology (3 cr)
- **Chem 111** Principles of Chemistry I (4 cr)
- **Chem 112** Principles of Chemistry II (5 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 (4 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):
- **MMBB 300** Survey of Biochemistry (3 cr)
- **MMBB 380** Introductory Biochemistry (4 cr)

**NOTE:** Students considering graduate school in biology are strongly encouraged to take Math 170, Chem 277/278, and MMBB 380.
9 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.

**Natural History**
- Biol 478 Animal Behavior (3 cr)
- Biol 481 Ichthyology (4 cr)
- Biol 483 Mammalogy (3 cr)
- Biol 489 Herpetology (4 cr)
- REM 341 Systematic Botany (3 cr)
- WLF 482 Ornithology (4 cr)

**Anatomy/Physiology**
- Biol 324 Comparative Vertebrate Anatomy (4 cr)
- Biol 423 Comparative Vertebrate Physiology (3 cr)
- Biol 428 Microscopic Anatomy (4 cr)
- Biol 450 Comparative Vertebrate Reproduction (3 cr)
- MMBB 460 Microbial Physiology (3 cr)
- PiSc 415 Plant Pathology (3 cr)

**Quantitative/Integrative Biology**
- Biol 425 ST: Experimental Field Ecology (3 cr)
- Biol 448 Plant-Animal Interactions (3 cr)
- Biol 456 Computer Skills for Biologists (3 cr)
- Ent 441 Insect Ecology (3 cr)
- Math 437 Mathematical Biology (3 cr)
- MMBB 425 Microbial Ecology (3 cr)
- WLF 440 Conservation Biology (3 cr)
- WLF 448 Fish and Wildlife Population Ecology (4 cr)

**Molecular/Cellular/Developmental (MCD) Biology**
- Biol 444 Genomics (3 cr)
- Biol 461 Neurobiology (3 cr)
- Biol 474 Principles of Developmental Biology (3 cr)
- Chem 414 Applications of Nanomaterials in Biomolecular Engineering (3 cr)
- MMBB 409 Immunology (3 cr)
- MMBB 440 Advanced Lab Techniques (4 cr)
- MMBB 475 Cell Biology (3 cr)
- MMBB 488 Genetic Engineering (3 cr)

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.

... Rationale: There are three requested changes: 1. Insert Biol 315 as a required course – this is simply the lab portion that is being split off from the old Biol 310. Thus, this is not really a change in degree requirements. 2. Add the new course Biol 324 to the electives in the “Anatomy and Physiology” list. 3. Add three alternatives to the Biol 411 senior experience course. The department intends to request UCGE approval for senior experience status for the courses being added here.

**Chemistry**

1. Change the following courses [Effective: Summer 2014]

   **Chem 542 Biochemistry and Molecular Biology (3 cr)**

2. Change the curricular requirements of Chemistry (B.S.) [Effective: Summer 2014]

   **D. Forensics Option**
   - Biol 115 Cells and the Evolution of Life (4 cr)
   - **Biol 310 Genetics (4 cr)**
   - Chem 111 Principles of Chemistry I (4 cr)
   - Chem 112 Principles of Chemistry II (5 cr)
   - Chem 253, Chem Quantitative Analysis and Lab (5 cr)
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Chem 277, Chem 278 Organic Chemistry I and Lab (4 cr)
Chem 305, Chem 307 Physical Chemistry and Lab (4 cr)
Chem 306, Chem 308 Physical Chemistry and Lab (4 cr)
Chem 372, Chem 374 Organic Chemistry II and Lab (4 cr)
Chem 409 Proseminar (1 cr)
Chem 454 Instrumental Analysis (4 cr)
CS 101 Introduction to Computer Science (3 cr)
Geol 426 Principles of Forensic Mineralogy and Geology (3 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)
MMBB 250 General Microbiology (3 cr)
MMBB 255 General Microbiology Lab (2 cr)
MMBB 380 Introductory Biochemistry (4 cr)
MMBB 382 Introductory Biochemistry Laboratory (2 cr)
Phys 211, Phys 211L Engineering Physics I and Lab (4 cr)
Stat 251 Statistical Methods (3 cr)

Any CS course (101 or higher) (3 cr)
One of the following (3-4 cr):
Biol 310 Genetics (4 cr)
Gene 314 General Genetics (3 cr)

One of the following (4 cr):
Phys 212, Engineering Physics II and Lab or
Phys 212L
Phys 213, Engineering Physics III and Lab (4 cr)
Phys 213L

Courses to total 120 credits for this degree

Rationale: The change from CS 101 to "CS 101 or higher" is actually just to correct an oversight – all our other degree options have "CS 101 or higher". CS 101 has not been taught for a number of years, but by going to "CS 101 or higher" we will still have it as an option if it ever is taught again. Adding GENE 314 as an alternative to BIOL 310 is done because both are sufficient genetics courses, but BIOL 310 is a fall course, GENE 314 is a spring course. The forensics option already has many courses that are only offered in the fall, and this change would allow us more flexibility in scheduling. The fact that BIOL 310 has 4 credits (includes a lab) and GENE 314 has 3 credits (no lab) is not important in this case. [It may be noted that the old MMBB majors gave students the same choice.]

Geography

1. Add the following course [Effective: Summer 2014]

   Geog 402 GIS Skills Development (1 cr, max 6)
Hands-on skills development in GIS and related technologies. Primary topics vary by semester, but may include topics such as GPS/GIS integration, server GIS and cartographic design. May be taken for credit multiple times.

Rationale: This course is created as a direct result of our outcomes assessment process. Both students and employers have let us know that they would like our students to have more practical skills along with the conceptual material they learn in our courses. Creating this one-credit course is intended to be an economical way of providing students with skills and experience that may help them be successful in seeking employment in GIS fields and/or in graduate school. It will not typically be taught by a TT faculty member; rather, the department will hire qualified instructors with special knowledge in the field being featured in a given semester. This may be a doctoral student in the department or a GIS professional from our region. It will be supported by funds from faculty salary savings, buyout, or other additional revenues.

2. Change the following course [Effective: Summer 2014]

   Geog 330 Urban Geography (3-43 cr)
Theory and models of the functions, origin, development, structure, and distribution of cities; land-use classification; geographic aspects of city planning. One hour additional meeting per week or project for fourth credit. One 1-day field trip. (Fall only)

Rationale: Class was originally designed to be a course that grad students could take with the four-credit option. Current instructor wishes to only offer it as three credits, an undergraduate course only.
3. Change the curricular requirements of Geographic Information Systems (UG Academic Certificate) [Effective: Summer 2014]

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 Spatial Analysis and Modeling (3 cr)
Geog 424 or Hydrologic Applications of GIS and Remote Sensing (3 cr)
Geog 524 cr
Geog 483 or Remote Sensing/GIS Integration (3 cr)
Geog 583
Geog 486 or Transportation, GIS and Planning (3 cr)
Geog 586
Geog 479 GIS Programming (3 cr)
Geog 575 Advanced GIS (3 cr)
Geog 587 Advanced Topics in Remote Sensing (3 cr)

Courses to total 15 credits for this certificate

Rationale: The minimum grade requirement is justified so as to establish a base quality of those students earning the GIS certificate.

Geological Sciences

1. Drop the following course [Effective: Summer 2014]

Geol 308 Ground Water Geology (3 cr)
Geologic factors controlling the infiltration, accumulation and movement of ground water in igneous, metamorphic and sedimentary rock environments. (Spring only)
Prereq: Geol 101/101L or Geol 111/111L, and Math 130 or Math 143

Rationale: Course has not been offered in the past four years and is on the dormant list.

Geol 390 Petroleum Geology (2 cr)
Petroleum technology for geologists. (Fall only)
Prereq: Geol 101/101L or Geol 111/111L

Rationale: Course has not been offered in the past four years and is on the dormant list.

Hydr J413/J513 Ground Water Resource Evaluation (3 cr)
Quantitative methods for the estimation of aquifer coefficients related to ground water resource evaluations. For grad credit, students are required to complete an additional independent research paper/project.
Prereq: Geol 309

Rationale: Course has not been offered in the past four years and is on the dormant list.

2. Add the following courses [Effective: Summer 2014]

Geol J433/J533 Geodynamics (4 cr)
This class focuses on the processes and mechanisms that cause motions within and on the surface of the Earth and other planets. Topics to be covered include plate boundary deformation, plate flexure, planetary heat transfer, convection in the mantle and core, melting and melt transport, magma dynamics, and large-scale lithospheric deformation. For graduate credit students will be expected to complete a research project and report. Course includes 3 hours of lecture and one 3 hour lab per week. Offered fall semester. Recommended Preparation: Math 175 or equivalent. Cooperative: open to WSU degree-seeking students.
Prereq: Math 170 or equivalent

Rationale: The course is an elective and fits within the degree requirements under the structure-tectonic option. Combined enrollment estimate is 15-20 students. It will not increase the teaching load as the instructor is a new faculty and has already corresponded with WSU faculty.

3. Change the following course [Effective: Summer 2014]
Geol 422  Principles of Geophysics (3-4 cr)
Outline of geophysical methods for geological investigations. One 1-day field trip. Course includes 3 hours of lecture and one 2-hour lab per week.

Rationale: Change from 3 credits to 4 and add a one 2-hr lab per week. Course will have larger field component and instruments used will be during the lab portion.

Physics

1. Drop the following course [Effective: Summer 2014]

Phys 511  Techniques of Experimental Physics (3 cr)
Development of experimental techniques and skills in active research fields; foundation for any field of physics. Nine hrs of lab a wk.

Rationale: Has always been taught as if it was an independent study course. Student works with major professor to learn the techniques involved in the planned Ph.D. research of the student. However, this is just part of any (beginning) Ph.D. research and, therefore, it does not have to be separated out as a (pseudo) graduate course. The requirement is waved.

2. Change the curricular requirements of Physics (B.S.) [Effective: Summer 2014]

Required course work includes the university requirements (see regulation J-) 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 211L  Engineering Physics II and Lab (4 cr)
Phys 212L  Engineering Physics III and Lab (4 cr)
Phys 213L  Modern Physics (3 cr)
Phys 305  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)

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, 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  Physical Instrumentation I (3 cr)

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

Physics and engineering electives (27 credit, 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, Phys 428, Phys 433, Phys 443, Phys 444.)

Courses to total 120 credits for this degree

Rationale: Phys 464 and Phys 484 have always been electives for the Physics B.S. degree. However, in the last edition of the catalog they were accidentally left out. This is to correct the error.

Statistical Science
1. Change the following courses [Effective: Summer 2014]

**Stat 251 Statistical Methods (3 cr)**

*May be used as general education credit in J-3-c. 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:** 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 143* or *2 yrs of high school algebra and Permission*  

Rationale: Evaluating the high school algebra prerequisite has proven to be difficult. The statement we are proposing is taken directly from the prerequisites for Math 143 which we think is reasonable for Stat 251 as well since any student who meets the requirements for Math 143 would also meet the requirements for Stat 251.

2. Change the curricular requirements of **Process & Performance Excellence** (GR Academic Certificate) [Effective: Summer 2014]

**Note:** A grade of 'B' or higher is required in all coursework for this academic certificate.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>Bus 439</td>
<td>Systems and Simulation (4 cr)</td>
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<tr>
<td>Bus 456 or</td>
<td>Quality Management (3 cr)</td>
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<td>Stat 456</td>
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<td>Bus 531</td>
<td>Design for Six Sigma and Lean Management (3 cr)</td>
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<td>Stat 446</td>
<td>Six Sigma Innovation (3 cr)</td>
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<td>Stat 431</td>
<td>Statistical Analysis (3 cr)</td>
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<td>Experimental Design (3 cr)</td>
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<td>Stat 519</td>
<td>Multivariate Analysis (3 cr)</td>
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<td>Electives</td>
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<td>Bus 456</td>
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<tr>
<td>ME 583</td>
<td>Reliability of Engineering Systems (3 cr)</td>
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Courses to total 12 credits for this certificate

Rationale: This new version of the certificate exchanges some courses that are no longer offered for courses that are taught regularly. This set of courses was suggested by the faculty from the College of Business to form a cohesive group that will deliver a similar skill set that is provided by the current version of the certificate. The “B or higher” requirement is being dropped to match the requirements for the Statistics Certificate.