PART I – NEW ACADEMIC PROGRAMS AND PROGRAM CHANGES

COLLEGE OF ENGINEERING

1. Request to change the requirements in the Bachelor of Science degree in Computer Engineering in the Department of Electrical and Computer Engineering.

The optional concentration in the Bachelor of Science degree in Computer Engineering is noted on the student's academic record when the requirements for the degree have been completed.

a. Under the heading Requirements for the Bachelor of Science Degree in Computer Engineering make the following changes:

(1) In item 3. c. Core add the following additional requirement:

(2) At least 3 credits from the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECE 305</td>
<td>4</td>
</tr>
<tr>
<td>ECE 313</td>
<td>3</td>
</tr>
<tr>
<td>ECE 366</td>
<td>3</td>
</tr>
</tbody>
</table>

(2) In item 3. c. Focus Track change the credits from '12' to '9'.

(3) In item 3. c. Recommended Electives add the following course:

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECE 456 Introduction to Communication and Network Security</td>
<td>3</td>
</tr>
</tbody>
</table>

b. Under the heading Biomedical Engineering Concentration make the following changes:

(1) In item 2. add the following course:

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECE 449 Fundamentals of Acoustics</td>
<td>3</td>
</tr>
</tbody>
</table>

(2) In item 3., change the course number of 'BE 445' to 'BE 444'.

Effective Fall 2017.

2. Request to change the requirements in the Bachelor of Science degree in Electrical Engineering in the Department of Electrical and Computer Engineering.

The optional concentration in the Bachelor of Science degree in Electrical Engineering is noted on the student's academic record when the requirements for the degree have been completed.

a. Under the heading Requirements for the Bachelor of Science Degree in Electrical Engineering make the following changes:

(1) In item 3. d. Communications/Signal Processing add the following course:

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECE 456 Introduction to Communication and Network Security</td>
<td>3</td>
</tr>
</tbody>
</table>

(2) In item 3. d. Biomedical Engineering add the following course:

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECE 449 Fundamentals of Acoustics</td>
<td>3</td>
</tr>
</tbody>
</table>

b. Under the heading Biomedical Engineering Concentration make the following changes:

(1) In item 2. add the following course:

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECE 449 Fundamentals of Acoustics</td>
<td>3</td>
</tr>
</tbody>
</table>
(2) In item 3., change the course number of ‘BE 445’ to ‘BE 444’.

Effective Fall 2017.

**COLLEGE OF NATURAL SCIENCE**

1. Request to change the requirements for the **Master of Arts** degree in **Biomedical Laboratory Science** in the Biomedical Laboratory Diagnostics Program. The University Committee on Graduate Studies (UCGS) will consider this request at its September 12, 2016 meeting.

   a. Under the heading **Admission** delete the last paragraph.

   b. Under the heading **Requirements for the Master of Arts Degree in Biomedical Laboratory Science** make the following changes:

      (1) In item 1. change the total credits from ‘8 or 9’ to ‘10 or 11’ and delete the following courses:

      BLD 801 Biomedical Laboratory Diagnostics Seminar   1
      BLD 821 Advanced Clinical Laboratory Practice   1

      Add the following courses:

      BLD 801 Biomedical Laboratory Diagnostics Seminar   2
      BLS 805 Communication in the Sciences   2

      (2) In item 2. change the total credits from ‘16’ to ‘14’ and add the following courses:

      BLD 821 Advanced Clinical Laboratory Practice   1
      BLD 832 Molecular Pathology Laboratory   2
      BLD 838 Clinical Context of Blood Product Management   1
      BLD 852 Immunodiagnostics Laboratory   2
      BLD 853 Advanced Flow Cytometry   2
      BLD 861 Emerging Infections, Emerging Technology   2
      BLD 870 Clinical Mass Spectrometry Theory   2
      BLD 871 Applied Clinical Mass Spectrometry   2
      BLD 872 Clinical Mass Spectrometry Laboratory   2

   Effective Fall 2017.

2. Request to change the requirements for the **Master of Science** degree in **Biomedical Laboratory Operations** in the Biomedical Laboratory Diagnostics Program. The University Committee on Graduate Studies (UCGS) will consider this request at its September 12, 2016 meeting.

   a. Under the heading **Admission** add the following after sentence one:

      Applicants must submit official transcripts, three letters of recommendation, a letter of intent or purpose statement, a brief resume, and General Record Examination (GRE) scores. For applicants in which English is not their first language, the Test of English as a Foreign Language (TOEFL) must be taken.

   b. Under the heading **Requirements for the Master of Science Degree in Biomedical Laboratory Operations** make the following changes:

      (1) In item 1. change the total credits from ‘6’ to ‘8’ and add the following course:

      BLD 805 Communication in the Sciences   2

      (2) Delete item 2. and renumber items 3. and 4. respectively to items 2. and 3.
(3) Change the credits in item 2. from ‘17’ to ‘14’.

(4) Add the following item 4.:

Complete 6 credits of electives as approved by the guidance committee.

Effective Fall 2017.

3. Request to change the requirements for the Master of Science degree in Clinical Laboratory Sciences in the Biomedical Laboratory Diagnostics Program. The University Committee on Graduate Studies (UCGS) will consider this request at its September 12, 2016 meeting.

a. Under the heading Admission replace the first paragraph with the following:

Regular admission to the Master of Science in Clinical Laboratory Science requires completion of a bachelor of science degree, with a minimum grade-point average of 3.0. Applicants must submit official transcripts, three letters of recommendation, a letter of intent or purpose statement, a brief resume, and the General GRE (Graduate Record Exam) score. For applicants in which English is not their first language, the Test of English as a Foreign Language (TOEFL) must be taken. Certification as a medical technologist/clinical laboratory scientist is preferred, but not required, for admission to the master’s degree program in clinical laboratory sciences. Scholastic record, experience, personal qualifications and career goals are taken into consideration to determine the applicant's acceptability.

b. Under the heading Requirements for the Master of Science Degree in Clinical Laboratory Sciences make the following changes:

(1) Under the heading Requirements for Both Plan A and Plan B replace the entire entry with the following:

1. All of the following courses:
   BLD 801 Biomedical Laboratory Diagnostics Seminar 2
   BLD 805 Communication in the Sciences 2
   BLD 811 Fundamentals of Scientific Research 1

2. At least 4 credits of 800-level Biomedical Laboratory Diagnostics courses approved by the student's academic advisor.

3. One course in biochemistry or cell biology as approved by the guidance committee.

4. One 400-level or 800-level course in statistics as approved by the guidance committee.

5. Not more than 9 credits in 400-level courses. All 400-level courses must be approved by the guidance committee.

Effective Fall 2017.
4. Request to establish a **Bachelor of Science** degree in **Integrative Biology** in the Department of Integrative Biology. The University Committee on Undergraduate Education (UCUE) recommended approval of this request at their January 28, 2016 meeting.

a. **Background Information:**

As never before, biology is assuming center stage in world events. Global warming, health and disease, sustainable life-styles and many more issues are the concern of all citizens of the world. To reflect this, the former Department of Zoology changed its name to the Department of Integrative Biology. The name change was driven by the current composition of our faculty and the need to develop a more integrated biology program to serve the needs of our students, both undergraduate and graduate.

These same concerns have driven the development of the new Bachelor of Science in Integrative Biology. MSU has a long history of offering successful undergraduate programs, and the Integrative Biology department wishes to expand their offerings. The new degree closely with national goals in life science education. In 2011 and again in 2015, the American Association for the Advancement of Science (AAAS) outlined core life science concepts in a call to action for the revision of biology undergraduate education (AAAS, 2011 and 2015). The new degree aligns with all five of these conceptual areas: evolution; pathways and transformations of energy and matter; information flow, exchange, and storage; structure and function; and systems. (Reference: American Association for the Advancement of Science (2011 and 2015). Vision and Change in Undergraduate Biology Education: A Call to Action, Washington, DC.)

Because of its broad, but focused base, it is anticipated that the Bachelor of Science in Integrative Biology will provide an additional entry for students into many professional (medical, dental, allied health, etc.) programs as well as many graduate programs.

To best serve our large and diverse undergraduate population, the Department of Integrative Biology will offer three bachelor’s degrees – the new Bachelor of Science degree in Integrative Biology, our original Bachelor of Science degree in Zoology and our Bachelor of Science degree in Environmental Biology/Zoology. The proposed Bachelor of Science in Integrative Biology differs from our current bachelor’s in Zoology in that it provides a broader foundation in the biological sciences, requiring courses in physiology, plant biology, microbiology, morphology, biochemistry and cell biology in addition to a core curriculum in genetics, ecology and evolution. These align well with the core concepts specified by AAAS above. The new major is similar to biology degrees offered at our peer institutions.

We will continue to offer the Bachelor of Science degree in Zoology which will now contain four concentrations – Animal Behavior/Neurobiology; Ecology, Evolution and Organismal Biology; Marine Biology; and Zoo and Aquarium Science. While there is some course overlap, the degrees have different requirements and prepare students for different career paths. Bachelor of Science zoology majors often come to MSU because they want to focus on Zoology. The Bachelor of Science degree in Environmental Biology/Zoology is particularly geared to students who will seek employment working with environmental issues often through government agencies, providing them with appropriate skillsets attractive to potential employers.

b. **Academic Programs Catalog Text:**

The Bachelor of Science degree in Integrative Biology provides students with an integrated foundation in biology and its underpinnings in chemistry, math, and physics. It prepares students for graduate and professional study and provide the skillsets necessary to enter the workforce.

**Requirements for the Bachelor of Science Degree in Integrative Biology**

1. The University requirements for bachelor’s degrees as described in the Undergraduate Education section of this catalog; 120 credits, including general elective credits, are required for the Bachelor of Science degree in Integrative Biology.

The University's Tier II writing requirement for the Integrative Biology major is met by completing two of the following courses: Zoology 328, 353, 355L, 425, 445, 483. Those courses are referenced in item 3. below. These courses may also fulfill requirements in items 3. g. and 3. h. below.
Students who are enrolled in the College of Natural Science may complete the alternative track to Integrative Studies in Biological and Physical Sciences that is described in item 1. under the heading Graduation Requirements in the College statement. Certain courses referenced in requirement 3. below may be used to satisfy the alternative track.

2. The requirements of the College of Natural Science for the Bachelor of Science degree.

The credits earned in certain courses referenced in requirement 3. below may be counted toward College requirements as appropriate.

3. The following requirements for the major:

<table>
<thead>
<tr>
<th>REQUIREMENTS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. One of the following groups of courses (9 or 10 credits):</td>
<td></td>
</tr>
<tr>
<td>(1) BS 161 Cell and Molecular Biology</td>
<td>3</td>
</tr>
<tr>
<td>BS 162 Organismal and Population Biology</td>
<td>3</td>
</tr>
<tr>
<td>BS 171 Cell and Molecular Biology Laboratory</td>
<td>2</td>
</tr>
<tr>
<td>BS 172 Organismal and Population Biology Laboratory</td>
<td>2</td>
</tr>
<tr>
<td>(2) BS 181H Honors Cell and Molecular Biology</td>
<td>3</td>
</tr>
<tr>
<td>BS 182H Honors Organismal and Population Biology</td>
<td>3</td>
</tr>
<tr>
<td>BS 191H Honors Cell and Molecular Biology Laboratory</td>
<td>2</td>
</tr>
<tr>
<td>BS 192H Honors Organismal and Population Biology Laboratory</td>
<td>2</td>
</tr>
<tr>
<td>(3) LB 144 Biology I: Organismal Biology</td>
<td>4</td>
</tr>
<tr>
<td>LB 145 Biology II: Cellular and Molecular Biology</td>
<td>5</td>
</tr>
<tr>
<td>b. One of the following groups of courses (5 or 6 credits):</td>
<td></td>
</tr>
<tr>
<td>(1) CEM 141 General Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>CEM 161 Chemistry Laboratory I</td>
<td>1</td>
</tr>
<tr>
<td>(2) CEM 151 General and Descriptive Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>CEM 161 Chemistry Laboratory</td>
<td>1</td>
</tr>
<tr>
<td>(3) CEM 181H Honors Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>CEM 185H Honors Chemistry Laboratory I</td>
<td>2</td>
</tr>
<tr>
<td>(4) LB 171 Principles of Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>LB 171L Introductory Chemistry Laboratory I</td>
<td>1</td>
</tr>
<tr>
<td>c. One course from each of the following groups of courses (8 credits):</td>
<td></td>
</tr>
<tr>
<td>(1) CEM 251 Organic Chemistry I</td>
<td>3</td>
</tr>
<tr>
<td>CEM 351 Organic Chemistry I</td>
<td>3</td>
</tr>
<tr>
<td>(2) CEM 252 Organic Chemistry II</td>
<td>3</td>
</tr>
<tr>
<td>CEM 352 Organic Chemistry II</td>
<td>3</td>
</tr>
<tr>
<td>(3) CEM 255 Organic Chemistry Laboratory</td>
<td>2</td>
</tr>
<tr>
<td>CEM 355 Organic Laboratory I</td>
<td>2</td>
</tr>
<tr>
<td>d. One of the following groups of courses (8 to 10 credits):</td>
<td></td>
</tr>
<tr>
<td>(1) PHY 231 Introductory Physics I</td>
<td>3</td>
</tr>
<tr>
<td>PHY 232 Introductory Physics II</td>
<td>3</td>
</tr>
<tr>
<td>PHY 251 Introductory Physics Laboratory I</td>
<td>1</td>
</tr>
<tr>
<td>PHY 252 Introductory Physics Laboratory II</td>
<td>1</td>
</tr>
<tr>
<td>(2) PHY 183 Physics for Scientists and Engineers I</td>
<td>4</td>
</tr>
<tr>
<td>PHY 184 Physics for Scientists and Engineers II</td>
<td>4</td>
</tr>
<tr>
<td>(3) LB 273 Physics I</td>
<td>4</td>
</tr>
<tr>
<td>LB 274 Physics II</td>
<td>4</td>
</tr>
<tr>
<td>(4) PHY 193H Honors Physics I – Mechanics</td>
<td>4</td>
</tr>
<tr>
<td>PHY 294H Honors Physics II – Electromagnetism</td>
<td>4</td>
</tr>
<tr>
<td>e. One of the following courses (3 or 4 credits):</td>
<td></td>
</tr>
<tr>
<td>MTH 124 Survey of Calculus I</td>
<td>3</td>
</tr>
<tr>
<td>MTH 132 Calculus I</td>
<td>3</td>
</tr>
<tr>
<td>MTH 152H Honors Calculus I</td>
<td>3</td>
</tr>
</tbody>
</table>
LB 118 Calculus I 4
f. One of the following courses (3 or 4 credits):
   LB 119 Calculus II 4
   MTH 126 Survey of Calculus II 3
   MTH 133 Calculus II 4
   MTH 153H Honors Calculus II 3
   STT 201 Statistical Methods 4
   STT 224 Introduction to Probability and Statistics for Ecologists 3
   STT 231 Statistics for Scientists 3
   STT 421 Statistics I 3
g. All of the following courses (14 credits):
   IBIO 341 Fundamental Genetics 4
   IBIO 355 Ecology 3
   IBIO 355L Ecology Laboratory (W) 1
   IBIO 445 Evolution (W) 3
   MMG 301 Introductory Microbiology 3
h. One of the following courses (4 credits):
   IBIO 306 Invertebrate Biology 4
   IBIO 320 Developmental Biology 4
   IBIO 328 Comparative Anatomy and Biology of Vertebrates (W) 4
i. One of the following courses (3 or 4 credits):
   IBIO 425 Cells and Development (W) 4
   MMG 409 Eukaryotic Cell Biology 3
j. One of the following courses (3 or 4 credits):
   IBIO 483 Environmental Physiology (W) 4
   PLB 301 Introductory Plant Physiology 3
   PLB 415 Plant Physiology 3
   PSL 310 Physiology for Pre-Health Professionals 4
   PSL 431 Human Physiology I 4
k. One of the following options, either (1) or (2):
   (1) BMB 401 Comprehensive Biochemistry 4
   (2) BMB 461 Advanced Biochemistry I 3
   BMB 462 Advanced Biochemistry II 3
l. Experiential Requirement:
   One additional course at the 300-level or above in laboratory bench work or field experience. This course may be chosen from Integrative Biology 306, 320, 328, 355L, 360, 365, 384, 390, 408, 425, 490, 494, 496; Animal Science 313; Fisheries and Wildlife 471; or Microbiology and Molecular Genetics 302. Other experiential courses may be chosen through consultation with the student’s academic adviser.
m. Additional credits in 300-400 level Integrative Biology courses as needed to meet the requirement of at least 33 credits. Students may complete more than one course, or pair of courses, from item 3. Additional courses completed from item 3. may be counted as Integrative Biology electives toward the 33 credits. Courses beyond those taken to satisfy item 3. may come from other departments with the approval of the student’s academic advisor.

Effective Fall 2016.
PART II - NEW COURSES AND CHANGES

COLLEGE OF AGRICULTURE AND NATURAL RESOURCES

ANS 300E  Animal Welfare Judging
Fall of every year. 1(0-2) A student may earn a maximum of 6 credits in all enrollments for this course. P: ANS 200E RB: ANS 110 and (ANS 305 or ZOL 313) RB: (ANS 110) and (ANS 305 or IBIO 313) R: Not open to freshmen. R: Not open to freshmen. A student may earn a maximum of 8 credits from the following courses: ANS 200A, ANS 200C, ANS 200D, ANS 200E, ANS 200F, ANS 300A, ANS 300C, ANS 300D, ANS 300E, and ANS 300F.
- Enhanced understanding of the physiological and behavioral indicators of animal welfare.
- Ethical values in the assessment of welfare status. Intercollegiate competition. Field trip required.

Effective Fall 2013 Effective Fall 2016

FW 463  Wildlife Disease Ecology
Spring of even years. 3(3-0) Interdepartmental with Large Animal Clinical Sciences. P: ZOL 355 or approval of department RB: (FW 423) or additional course work in zoology, microbiology and environmental sciences. RB: (FW 423) or additional course work in integrative biology, microbiology and environmental sciences. R: Open to juniors or seniors or approval of department. Not open to students with credit in FW 863.

Effective Spring 2014 Effective Fall 2016

HNF 250  Contemporary Issues in Human Nutrition
Fall of every year. 2(1-2) P: (HNF 150) and completion of Tier I writing requirement R: Open to students in the Nutritional Sciences Major. R: Open to students in the Nutritional Sciences Major or in the Lyman Briggs Nutritional Sciences Coordinate Major.

Effective Summer 2016 Effective Fall 2016

HNF 350  Advanced Human Nutrition and Metabolism
Spring of every year. 4(5-0) P: (HNF 250 or HNF 320) and (PSL 250 or PSL 310 or PSL 431) and (BMB 200 or BMB 401 or BMB 461) R: Open to juniors or seniors in the Dietetics Major or in the Nutritional Sciences Major. R: Open to juniors or seniors in the Dietetics Major or in the Nutritional Sciences Major or in the Lyman Briggs Nutritional Sciences Coordinate Major.
- Nutrient function, metabolism, and interaction in humans at the molecular, cellular, tissue, organ and system level. Mechanistic relationships of nutritional status to health and disease.
SA: HNF 461, HNF 462

Effective Spring 2017

HNF 377  Applied Community Nutrition
Fall of every year. 4(3-2) P: HNF 250 or HNF 320 R: Open to juniors or seniors in the Dietetics Major or in the Nutritional Sciences Major. R: Open to juniors or seniors in the Dietetics Major or in the Nutritional Sciences Major or in the Lyman Briggs Nutritional Sciences Coordinate Major.
- Skill development in nutritional assessment including dietary, anthropometric, clinical, biochemical and ecological assessment.

Effective Summer 2016 Effective Fall 2016
HNF 453  Nutrition and Human Development
Spring of every year. 3(3-0) P: (HNF 375 or HNF 377) and ((PSL 250 or concurrently) or PSL 310 or PSL 431) P: (HNF 375 or HNF 377) and (PSL 250 or PSL 310 or PSL 431) R: Open to juniors or seniors in the Dietetics major or in the Nutritional Sciences major or in the Nutritional Sciences minor. R: Open to juniors or seniors in the Dietetics Major or in the Nutritional Sciences Major or in the Lyman Briggs Nutritional Sciences Coordinate Major.
Role of nutrients in anatomical, physiological, and biochemical processes as related to human growth and development. Nutrition throughout the life cycle. Nutritional assessment integrating the nutrition care process and age specific programs.
SA: HNF 376
Effective Fall 2014 Effective Fall 2016

HRT 231  Clerkship in Grape Harvesting and Processing
Fall of even years. Northwestern Michigan College 1(0-2) R: Open to undergraduate students or agricultural technology students.
NEW
Hands-on skills in the management of grape harvest and processing; winery and cellar operations. Course meets on-farm. Field trips required.
Effective Spring 2016

HRT 232  Principles and Practices of Grape Production
Principles of Viticulture
Spring of even years. Northwestern Michigan College, Northwestern Michigan College, Northwestern Michigan College, Northwestern Michigan College 3(3-0) P: PLB 105 R: Open to undergraduate students or agricultural technology students.
Grapevine physiology, structure, and function. Techniques for vineyard establishment. Cultivar and rootstock selection, influence of environmental factors on vine growth, pre-plant site selection and preparation, training and trellising systems, cultural practices for canopy management, and methods of crop control. Grapevine physiology, grape production, cultural practices and vineyard management. Field trip required.
SA: HRT 432
Effective Fall 2014 Effective Spring 2016

HRT 233  Field Practices of Viticulture
Summer of even years. 3(2-2) P: HRT 232 R: Open to undergraduate students or agricultural technology students.
NEW
Cool climate grape production and vineyard management. Field trips required.
Effective Spring 2016

**COLLEGE OF ENGINEERING**

MSE 310  Phase Equilibria in Materials
Fall of every year. 3(3-0) P: (MSE 250 or concurrently) and ((MTH 234 or concurrently) or (MTH 254H or concurrently)) or (LB 220 or concurrently) P: (MSE 250) and ((MTH 234 or concurrently) or (MTH 254H or concurrently)) or (LB 220 or concurrently)) R: Open to juniors or seniors in the Materials Science and Engineering Major or in the Materials Science and Engineering Minor.
Enthalpy. Entropy. Free energy. Phase changes in metal, ceramic, and polymer materials systems. Application to alloying, phase diagram determination, and electrochemistry.
SA: MSE 351
Effective Fall 2015 Effective Fall 2017
MSE 331  Materials Characterization Methods I
Fall of every year. 2(1-3) P: MSE 310 or concurrently R: Open to juniors or seniors in the Materials Science and Engineering Major.
Thermal analysis, microindentation techniques, quantitative optical microscopy, effects of alloying on creep deformation, slip systems in ionic crystals, environmental effects including galvanic corrosion, passivation. Thermal analysis, microindentation techniques, quantitative optical microscopy, effects of alloying on creep deformation, slip systems in ionic crystals, viscoelastic of solids, and polymer rheology.
SA: MSE 375
Effective Fall 2015 Effective Fall 2017

MSE 381  Materials Characterization Methods II
Spring of every year. 2(1-3) P: MSE 331 and (MSE 360 or concurrently) and (MSE 330 or concurrently) and (MSE 370 or concurrently) P: (MSE 260 or concurrently) and (MSE 360 or concurrently) and (MSE 370 or concurrently) R: Open to juniors or seniors in the Materials Science and Engineering Major.
Characterization of materials by electron microscopy, X-ray diffraction and fluorescence spectroscopy. Fractography, surface analysis, dynamic mechanical analysis, electrical and thermal property measurements.
Effective Fall 2015 Effective Fall 2017

MSE 466  Design and Failure Analysis (W)
Spring of every year. 3(2-3) P: (MSE 320 and MSE 381) and completion of Tier I writing requirement R: Open to seniors in the Materials Science and Engineering Major.
Modes and causes of failure in mechanical components and role of design. Non-destructive evaluation. Legal and economic aspects of materials failure. Student projects.
SA: MSM 466
Effective Fall 2015 Effective Fall 2017

CSE 843  Language and Interaction
Spring of even years. 3(3-0) P: CSE 440 RB: Programming skills, Basic probability and statistical knowledge. RB: Programming skills, Basic probability and statistical knowledge. Proposed text:
Programming skills, Basic probability and statistical knowledge. Content from CSE 440 Introduction to Artificial Intelligence.
Introduction to foundations and the state-of-the-art technology enabling natural language communication with artificial agents. Speech recognition, acoustic modeling and language modeling, dialogue and discourse modeling, psycholinguistic studies on situated human language processing, and their applications in situated human robot dialogue.
Effective Spring 2013 Effective Fall 2016

ECE 331  Microprocessors and Digital Systems
Fall of every year. 4(3-3) P: ((EGR 102 and (CSE 251 or concurrently)) or (CSE 232 or CSE 220)) and ECE 230 P: (CSE 220 or CSE 232) and ECE 230 R: Open to students in the Department of Electrical and Computer Engineering and open to students in the Department of Computer Science and Engineering.
SA: EE 331
Effective Fall 2013 Effective Fall 2017
ECE 448  Modeling and Analysis of Bioelectrical Systems  
Spring of odd years, Spring of every year 3(3-0) P: ECE 366 or ECE 313 P: PHY 184 R: Open to students in the College of Engineering, R: Open to juniors or seniors in the College of Engineering. Basics of deterministic and stochastic linear systems, principles of biophysics and electrophysiology, theory and principles of system identification, methods to formulate dynamic mathematical and computer models of bioelectrical systems, applications to neural systems and neuroprosthetics. Principles of biophysics and electrophysiology, ionic basis of neuronal excitability, introduction to computational models of signal generation and propagation in the nervous system, applications to neural systems and neuroprosthetics. Effective Fall 2013 Effective Fall 2017

ECE 449  Fundamentals of Acoustics  
Fall of every year. 3(3-0) P: (MTH 235 and ECE 280) or ME 391 R: Open to juniors or seniors in the College of Engineering. 
NEW Development of the fundamental theoretical concepts of acoustical systems, including plane and spherical waves, radiation, diffraction, and absorption. Effective Fall 2017

ECE 456  Introduction to Communication and Network Security  
Spring of every year. 3(3-0) P: ECE 280 or STT 351 R: Open to Juniors and Senior in the College of Engineering. Security primitives, major network security protocols and applications, system security practices, wireless security physical-layer built-in security, secure multiple-party computing, privacy-preserving computation. Effective Spring 2017

IBIO 492  Interdisciplinary Studies in Conservation Medicine  
Spring of every year. Abroad 4(4-0) P: (BS 161 and BS 162) or (BS 181H and BS 182H) or (LB 144 and LB 145) R: Approval of department. 
NEW Interdisciplinary studies focused on "health" as defined by the interactions of animal health, ecosystem health, and human health, viewed through the lens of human culture. Request the use of ET-Extension to postpone grading. The work for the course must be completed and the final grade reported within 1 semester after the end of the semester of enrollment. Effective Spring 2017

IBIO 492L  Advanced Research Applications in Conservation Medicine  
Spring of every year. Abroad 4(0-12) P: (BS 161 and BS 162) or (BS 181H and BS 182H) or (LB 144 and LB 145) R: Approval of department. 
NEW Field and laboratory techniques for assessing and monitoring biodiversity and health of humans, animals, and ecosystems. Tools and techniques will be drawn from ecology, microbiology, molecular biology, genetics, histopathology, bioinformatics and statistics. Request the use of ET-Extension to postpone grading. The work for the course must be completed and the final grade reported within 1 semester after the end of the semester of enrollment. Effective Spring 2017
IBIO 493  International Communications in Conservation Medicine (W)  
Spring of every year. 4(4-0) P: ((BS 161 and BS 162) and completion of Tier I writing requirement)  
or ((BS 181H and BS 182H) and completion of Tier I writing requirement) or ((LB 144 and LB 145)  
and completion of Tier I writing requirement)  
NEW  Development of communication skills (written and oral) to convey scientific information to  
scientists, health professionals, general public, and indigenous communities.  
Request the use of ET-Extension to postpone grading.  
The work for the course must be completed and the final grade reported within 1 semester  
after the end of the semester of enrollment.  
Effective Spring 2017

MTH 235  Differential Equations  
Fall of every year. Spring of every year. Summer of every year. 3(4-0) P: MTH 234 or MTH 254H or  
LB 220  R: Not open to students in the Department of Mathematics or in the Lyman Briggs  
Computational Mathematics Coordinate Major or in the Lyman Briggs Mathematics Coordinate  
Major.  R: Not open to students in the Bachelor of Science in Mathematics or in the Bachelor of  
Arts in Mathematics or in the Lyman Briggs Mathematics Coordinate Major.  Not open to students  
with credit in MTH 255H or MTH 340 or MTH 347H. Not open to students with credit in MTH 347H  
or MTH 340.  
Separable and exact equations. Linear equations and variation of parameters. Higher  
Introduction to partial differential equations and Fourier series.  
Effective Summer 2015 Effective Fall 2016

MTH 925  Random Variables and Stochastic Processes  
Fall of every year. 3(3-0) R: Open to doctoral students in the College of Natural Science or  
approval of department.  
NEW  Introduction to measure theoretic probability theory.  Topics include infinite product  
spaces, Kolomogorov extension theorem, Borel Cantelli Lemma, law of large numbers,  
central limit theorem, conditioning, filtrations, martingales, Markov chains, Wiener process.  
Effective Fall 2016

MTH 970  Dynamics I  
Fall of every year. 3(3-0) P: (MTH 868 or concurrently) and MTH 869 or approval of department R:  
Open to doctoral students in the College of Natural Science or approval of department.  
NEW  Flows and diffeomorphisms, Examples, Topological and Smooth Conjugacy, Recurrence  
and Limit Sets, Circle Diffeomorphisms, Symbolic Spaces and Expanding Maps, Structural  
Stability of Expanding Maps, Perron-Frobenius Theorem and Discrete Markov Processes,  
Topological Entropy and Volume Growth, Zeta Function, Homological Growth,  
Linearization, Bifurcation Theory.  
Effective Fall 2016

MTH 971  Dynamics II  
Spring of every year. 3(3-0) P: (MTH 868 or concurrently) and (MTH 869 or concurrently) R: Open  
to doctoral students in the College of Natural Science or approval of department.  
NEW  Hyperbolic Theory, Anosov Systems, Invariant Manifold Theory, Geodesic Flows on  
Riemannian Manifolds, Structural Stability Theorems, Generic Properties, Horseshoe  
diffeomorphisms, Basic Theory of Hamiltonian Systems on Manifolds, Variational  
Principles, Lagrangian and Hamiltonian Mechanics, Poisson Brackets, Introduction to  
Completely Integrable Systems.  
Effective Spring 2017

NEU 416  Development of the Nervous System Through the Lifespan  
Fall of every year. 3(3-0) Interdepartmental with Zoology, Interdepartmental with Integrative Biology  
P: NEU 302 or ZOL 402 or PSY 209 RB: ZOL 341 R: Open to undergraduate students in the  
Program in Neuroscience or in the Department of Integrative Biology or in the Department of  
Psychology or in the Lyman Briggs Neuroscience Major or in the Lyman Briggs Zoology Coordinate  
Major.  
Development of neurons and their connections, roles of both genetics and behavioral  
experience in shaping the mammalian nervous system.  
Effective Fall 2015 Effective Fall 2016
NEU 804  Molecular and Developmental Neurobiology
Fall of every year. 3(3-0) Interdepartmental with Pathobiology and Diagnostic Investigation and Pharmacology and Toxicology and Psychology and Zoology. Interdepartmental with Integrative Biology and Pathobiology and Diagnostic Investigation and Pharmacology and Toxicology and Psychology RB: Bachelor's degree in a Biological Science or Psychology. R: Open to graduate students in Neuroscience major.
Nervous system specific gene transcription and translation. Maturation, degeneration, plasticity, and repair in the nervous system.
Effective Fall 2006  Effective Fall 2016

STT 422  Statistics II
Fall of every year. Spring of every year. Summer of every year. 3(3-0) P: STT 421 P: STT 421 or STT 441 Not open to students with credit in STT 464.
Goodness of fit and other non-parametric methods. Linear models including multiple regression and ANOVA for simple experimental designs.
Effective Fall 2014  Effective Fall 2017

STT 441  Probability and Statistics I: Probability
Fall of every year. Spring of every year. Summer of every year. 3(3-0) P: MTH 234 or MTH 254H or LB 220 or approval of college
Effective Fall 2013  Effective Fall 2017

STT 442  Probability and Statistics II: Statistics
Fall of every year. Spring of every year. 3(3-0) P: STT 441 and (MTH 309 or MTH 314 or MTH 317H or MTH 415)
Estimation, testing hypotheses and simple and multiple regression analysis. Time series: ARMA (Auto Regressive Moving Average) and ARIMA (Auto Regressive Integrated Moving Average) models, data analysis and forecasting. Parameter estimation, sampling distributions, confidence intervals, hypothesis testing, simple and multiple regression, analysis of variance. Time series models, data analysis and forecasting.
Effective Fall 2014  Effective Fall 2017

STT 464  Statistics for Biologists
Fall of every year. 3(3-0) Interdepartmental with Animal Science and Crop and Soil Sciences. P: MTH 103 or MTH 110 or MTH 116 P: MTH 103 or MTH 110 or MTH 116 or MTH 132 RB: STT 421
Biological random variables. Estimation of population parameters. Testing hypotheses. Linear correlation and regression. Analyses of counted and measured data to compare several biological groups including contingency tables and analysis of variance.
Effective Fall 2014  Effective Summer 2016

COLLEGE OF NURSING

NUR 300  Pathophysiology
Fall of every year. Spring of every year. Summer of every year. 4(4-0) P: ANTR 350 and (PSL 310 or PSL 250) P: (ANTR 350) and (PSL 310 or PSL 250) RB: Preprofessional students entering patient care disciplines. Not open to students with credit in NUR 301.
How disrupting normal structures and functions of the human body leads to disease processes from the cellular to the multi-system level. Critical examination of the mechanisms underlying signs and symptoms.
SA: NUR 341
Effective Summer 2015  Effective Summer 2016
NUR 301  Clinical Pathophysiology
Fall of every year. Spring of every year. Summer of every year. 3(3-0) P: ((PSL 250 or PSL 310) or (PSL 431 and PSL 432)) and ANTR 350 R: Open to students in the College of Nursing. Not open to students with credit in NUR 300.
How disrupting normal structures and functions of the human body leads to disease processes from the cellular to the multisystem level. Critical examination of the mechanisms underlying signs and symptoms of diseases.
Effective Fall 2015 Effective Summer 2016

COLLEGE OF OSTEOPATHIC MEDICINE

OST 574  Female Reproductive System
Spring of every year. Summer of every year. 3(3-0) R: Open to graduate-professional students in the College of Osteopathic Medicine.
Normal structure and function and pathologies related to the female reproductive system. Integration of basic science and clinical information in obstetrics and gynecology. Request the use of the Pass-No Grade (P-N) system. Effective Summer 2013 Effective Summer 2017

OST 687  Peru Medical Service (I)
Fall of every year. Spring of every year. Summer of every year. 3 to 6 credits. A student may earn a maximum of 18 credits in all enrollments for this course. RB: Fluency in Spanish to interact with patients R: Open to graduate-professional students in the College of Osteopathic Medicine.
NEW The Peru Medical Service course is a three (3) credit hour, two week elective course that provides students with opportunity to grow personally and professionally. Students are immersed in the Peruvian culture and provide healthcare services under the supervision of licensed U.S. physicians working in tandem with local providers. Offered second half of semester. Request the use of the Pass-No Grade (P-N) system. Request the use of ET-Extension to postpone grading. The work for the course must be completed and the final grade reported within 2 semesters after the end of the semester of enrollment. Effective Summer 2016

OST 688  The Cuban Health Care System & Culture (I)
Fall of every year. Spring of every year. Summer of every year. 3 to 6 credits. A student may earn a maximum of 18 credits in all enrollments for this course. R: Open to graduate-professional students in the College of Osteopathic Medicine.
NEW Primary goal of this 2-week, 4 credit, course is to introduce students to the health care delivery model in Cuba while experiencing the country’s rich culture. Students will explore the public health and community medicine model by on site observation of the delivery of community health clinics, maternal health, pediatric care, and geriatric care. Students will rotate through depts of 3 teaching hospitals in Havana. Includes lectures and presentations by Cuban health care officials and clinicians. Students will observe and participate in the care of patients & learn Cuba’s history & culture. Offered second half of semester. Request the use of the Pass-No Grade (P-N) system. Request the use of ET-Extension to postpone grading. The work for the course must be completed and the final grade reported within 2 semesters after the end of the semester of enrollment. Effective Spring 2017
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<th>Departmental Notes</th>
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<tbody>
<tr>
<td>PDI 854</td>
<td>Advanced Clinical Pathology</td>
<td>Fall of odd years. 2(2-0) 3(2-2)</td>
<td>RB: Doctor of Veterinary Medicine degree. R: Approval of department. Hematology, including anemias, leukocyte responses and hemostasis. Evaluation of clinical chemistry, urinalysis, and endocrinology. Interpretation and pathogenesis of veterinary clinical pathology laboratory abnormalities. SA: PTH 854</td>
<td>Effective Fall 2009 Effective Fall 2017</td>
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<tr>
<td>PDI 855L</td>
<td>Advanced Clinical Pathology Laboratory</td>
<td>Fall of odd years. 1(0-2)</td>
<td>RB: Doctor of Veterinary Medicine degree. R: Approval of department. Clinical pathology laboratory techniques including sample preparation and examination of blood smears and cytologic preparations. DELETE COURSE</td>
<td>Effective Fall 2017</td>
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<tr>
<td>PSL 537</td>
<td>Basic Principles of Pathology</td>
<td>Fall of every year. 1(1-0)</td>
<td>R: Open to graduate-professional students in the College of Osteopathic Medicine. Basic principles of general pathology, with emphasis on principles of cellular adaptations, cell injury, inflammation, tissue repair, hemodynamic disorders, and neoplasia. Request the use of the Pass-No Grade (P-N) system. DELETE COURSE</td>
<td>Effective Fall 2016</td>
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<tr>
<td>PSL 539</td>
<td>Principles of Cell Biology and Pathophysics</td>
<td>Fall of every year. 4(3-2)</td>
<td>Interdepartmental with Human Anatomy and Biochemistry and Molecular Biology and Microbiology and Molecular Genetics. R: Open to graduate-professional students in the College of Osteopathic Medicine. NEW Modern concepts of human cell biology as a basis for understanding integration of structure (histology) and function (physiology) in health and disease (pathology). Introduction to adaptive growth response, cell injury, inflammation, hemodynamic disorders, and tissue repair. Request the use of the Pass-No Grade (P-N) system.</td>
<td>Effective Fall 2016</td>
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<tr>
<td>VM 558</td>
<td>Digestive Diseases of Domestic Animals</td>
<td>Fall of every year. 2(2-0) 3 credits</td>
<td>RB: Completion of Year 2 of the graduate professional program in the College of Veterinary Medicine R: Open to graduate-professional students in the College of Veterinary Medicine. Digestive diseases of domestic animals. Diagnosis, therapy, prophylaxis, and management.</td>
<td>Effective Fall 2009 Effective Fall 2016</td>
</tr>
</tbody>
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