The effective date for new programs subject to Statewide Academic Program review is implemented in accordance with the Statewide Academic Program Review calendar.
TO: Faculty Senate

This report is prepared and distributed for the following purposes:

1. To report new academic programs, changes in academic programs, discontinuations of academic programs, new courses, permanent changes in courses, and deletions of courses.
2. To notify the initiating colleges, schools, and departments of approval by the University Committee on Curriculum of their requests for new academic programs, changes in academic programs, discontinuations of academic programs, new courses, permanent changes in courses, and deletions of courses. Any items not approved by the Faculty Senate will be reported to the appropriate college and department or school.
3. To provide information to members of the faculty in each department about academic programs and courses in all colleges, departments, and schools of the University.

Reports of the University Committee on Curriculum to the Faculty Senate are organized as follows:

PART I - NEW ACADEMIC PROGRAMS AND PROGRAM CHANGES:

Organized by colleges in alphabetical order. For a given college, academic units are organized in alphabetical order. For a given academic unit, degrees, majors, and specializations are organized in alphabetical order.

PART II - NEW COURSES:

Organized by academic units in alphabetical order; All-University courses appear last. For a given academic unit, courses are organized according to the names associated with course subject codes, in alphabetical order. Courses with the same subject code are in numerical order.

PART III - COURSE CHANGES:

Organized by academic units in alphabetical order; All-University courses appear last. For a given academic unit, courses are organized according to the names associated with course subject codes, in alphabetical order. Courses with the same subject code are in numerical order.

Not all of the above categories, and not all of the colleges and academic units, will necessarily appear in any given Senate Report.

1One or more of the abbreviations that follow may be included in a course entry:

P: = Prerequisite monitored in SIS
C: = Corequisite
R: = Restriction
RB: = Recommended background
SA: = Semester Alias
TO: Faculty Senate
FROM: University Committee on Curriculum
SUBJECT: New Academic Programs and Program Changes: New Courses and Course Changes

PART I - NEW ACADEMIC PROGRAMS AND PROGRAM CHANGES

MICHIGAN STATE UNIVERSITY
February 16, 2016

COLLEGE OF ARTS AND LETTERS

1. Delete the curriculum and degree requirements for the Master of Arts degree in American Studies in the College of Arts and Letters. The University Committee on Graduate Studies (UCGS) provided consultative commentary to the Provost after considering this request at its November 9, 2015 meeting. The Provost made the determination to discontinue the program after considering the consultative commentary from the University Committee on Graduate Studies.

No new students are to be admitted to the program effective Spring 2010. No students are to be readmitted to the program effective Spring 2010. Effective Fall 2015, coding for the program will be discontinued and the program will no longer be available in the College of Arts and Letters. Students who have not met the requirements for the Master of Arts Degree in American Studies through the College of Arts and Letters prior to Fall 2015 will have to change their major.

2. Change the requirements for the Disciplinary Teaching Minor in English that is available for elementary and secondary certification in the Department of English. The Teacher Education Council (TEC) approved this request at its January 11, 2016 meeting.

a. Under the heading ENGLISH make the following change:

(1) In item 3. change ‘ENG 230’ to ‘FLM 230’.

Effective Summer 2016.

3. Delete the curriculum and degree requirements for the Specialization in Postcolonial and Diaspora Literature and Culture in the Department of English. The University Committee on Undergraduate Education (UCUE) provided consultative commentary to the Provost after considering this request at its October 22, 2015 meeting. The Provost made the determination to discontinue the program after considering the consultative commentary from the University Committee on Undergraduate Education.

No new students are to be admitted to the program effective Fall 2015. No students are to be readmitted to the program effective Fall 2015. Effective Spring 2017, coding for the program will be discontinued and the program will no longer be available in the Department of English. Students who have not met the requirements for the Specialization in Postcolonial and Diaspora Literature and Culture through the College of Arts and Letters prior to Spring 2017 will have to change their major.

4. Delete the curriculum and degree requirements for the Specialization in Women, Gender and Social Justice in the Program in Women, Gender and Social Justice. The University Committee on Undergraduate Education (UCUE) provided consultative commentary to the Provost after considering this request at its December 3, 2015 meeting. The Provost made the determination to discontinue the program after considering the consultative commentary from the University Committee on Undergraduate Education.

No new students are to be admitted to the program effective Fall 2015. No students are to be readmitted to the program effective Fall 2015. Effective Spring 2017, coding for the program will be discontinued and the program will no longer be available in the Program in Women, Gender and Social Justice. Students who have not met the requirements for the Specialization in Women, Gender and Social Justice through the College of Arts and Letters prior to Spring 2017 will have to change their major.
1. Establish a Graduate Specialization in Nonprofit Fundraising in the Department of Communication. The University Committee on Graduate Studies (UCGS) recommended approval of this request at its November 9, 2015 meeting.

a. Background Information:

The idea for the nonprofit fundraising specialization, informed by survey results of over 300 MSU communication majors, stemmed from an interest in providing communication master's students with a specific career path. There are no comparable academic programs offered at MSU related to fundraising or nonprofit organizations. Most academic programs related to nonprofit fundraising at other universities are offered as professional certificates without communication content in the curriculum. This specialization is unique in that it adds knowledge about nonprofit fundraising to a master's degree in a communication field.

According to fundraising professionals in the field, students who have nonprofit fundraising knowledge on top of graduate training in communication sciences would be highly desirable for entry-level development associate positions. The availability of such jobs and demand for qualified candidates have grown over the past ten years. Because there are not enough qualified candidates for these positions, our students would be in demand for jobs.

The location of MSU is ideal for this specialization given the concentration of nonprofit organizations in the state capital of Lansing, Michigan. Representatives of Lansing-area nonprofit organizations are eager to collaborate to offer practicum opportunities for students.

b. Academic Programs Catalog Text:

The Graduate Specialization in Nonprofit Fundraising, which is administered by the Department of Communication in the College of Communication Arts and Sciences, is designed for students with interests in fundraising and development work in nonprofit organizations.

The graduate specialization is available as an elective to students who are enrolled in master’s degree programs in the College of Communication Arts and Sciences at Michigan State University. With the approval of the department and college that administer the student's degree program, the courses that are used to satisfy the specialization may also be used to satisfy the requirements for the master’s degree.

The Specialization in Nonprofit Fundraising provides students with: (1) an understanding of a variety of fundraising strategies, the role of fundraising within nonprofit organizations, and the role and responsibilities of the development professional in the fundraising process; (2) an understanding of theory and research on social influence and how to employ this knowledge to promote the fundraising activities of a nonprofit organization; and (3) practice in assisting the fundraising activities of a nonprofit organization.

Students who plan to complete the requirements for the graduate specialization must consult the graduate advisor for the specialization in the College of Communication Arts and Sciences.

Requirements for the Graduate Specialization in Nonprofit Fundraising

Students must complete the following courses (9 credits):

1. Complete the following course (3 credits):
   ADV 816 Fundraising and Philanthropy in Nonprofit Organizations

2. One of the following courses (3 credits):
   ADV 823 Consumer Behavior Theories
   COM 860 Persuasion

3. One of the following courses (3 credits):
   ADV 893 Practicum
   COM 893 Practicum

Effective Summer 2016
COLLEGE OF EDUCATION

1. Change the requirements for the Bachelor of Arts degree in Special Education in the Department of Counseling, Educational Psychology and Special Education. The University Committee on Undergraduate Education (UCUE) approved this request at its January 14, 2016 meeting. The Teacher Education Council (TEC) approved this request at its January 11, 2016 meeting.

a. Add the following Admission statement:

To earn a degree in special education, students must apply and be admitted to the Teacher Certification Program administered by the Department of Teacher Education in the College of Education. Refer to Admission to the Teacher Certification Program in the Department of Teacher Education section of this catalog. Information about admission requirements and the application process can be found at http://education.msu.edu/academics/undergraduate/apply-teacher-prep.asp.

In addition to general admission requirements, applicants applying for admission to the Teacher Certification Program with a major in special education must also complete one or two supervised pre-admission experiences totaling at least 42 hours in the area of learning disabilities. Prospective special education students are strongly encouraged to talk with special education faculty about the potential value of sites for securing the required experience. Applicants to the special education program must submit a form verifying completion of the experience with the completed application. Only students who have completed the required experience will be considered for admission.

b. Under the heading Requirements for the Bachelor of Arts Degree in Special Education replace the entire entry with the following:

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 Arts degree in Special Education.

   The completion of Mathematics 201 referenced in item 2. b. (1) below may also satisfy the University mathematics requirement.

   The University’s Tier II writing requirement for the Special Education major is met by completing Counseling, Educational Psychology and Special Education 301. That course is referenced in item 2. d. below.

   CREDITS

2. The following requirements for the major:

   a. Professional Education Courses (21 credits):

      All of the following courses with a grade-point average of 2.5 or above with no individual grade below 2.0:

      | Course | Title                                           | Credits |
      |--------|-------------------------------------------------|---------|
      | CEP 240| Diverse Learners in Multicultural Perspective   | 3       |
      | TE 150 | Reflections on Learning                         | 3       |
      | TE 301 | Literacy, Learners and Learning in Context – Elementary (W) | 3       |
      | TE 403 | Teaching of Science to Diverse Learners – Elementary | 3       |
      | TE 404 | Teaching of Social Studies to Diverse Learners – Elementary | 3       |
      | TE 405 | Teaching of Language and Literacy to Diverse Learners – Elementary | 3       |
      | TE 406 | Teaching of Mathematics to Diverse Learners – Elementary | 3       |

   b. Planned Program for Elementary Education for Special Education Majors (20 to 30 credits):

      All courses are required unless otherwise stated. Some courses below are also required for or applicable to the Elementary Teaching Majors. The Planned Program must total at least 20 credits that are not double-counted with the required teaching major. All candidates for elementary certification must pass each Elementary Planned Program course with a minimum grade of 2.0.

      (1) Both of the following mathematics courses (6 credits):

      | Course | Title                                           | Credits |
      |--------|-------------------------------------------------|---------|
      | MTH 201| Elementary Mathematics for Teachers I            | 3       |
      | MTH 202| Elementary Mathematics for Teachers II           | 3       |
Mathematics 201 and Mathematics 202 are required for the Elementary Mathematics Teaching Major in which case 0 credits count toward the Planned Program. Mathematics 201 and 202 are prerequisites for Teacher Education 406 and must be completed with a minimum grade of 2.0 prior to enrollment in Teacher Education 406.

(2) The following course in children’s literature (3 credits):
TE 348 Reading and Responding to Children’s Literature

Teacher Education 348 is required for the Language Arts Teaching Major in which case 0 credits count toward the Planned Program. Teacher Education 348 is a prerequisite for Teacher Education 405 and must be completed with a minimum grade of 2.0 prior to enrollment in Teacher Education 405.

(3) One of the following courses on language acquisition and development (3 or 4 credits):
CSD 333 Oral Language Development
ENG 302 Introduction to English Language Studies
LIN 200 Introduction to Language
LIN 401 Introduction to Linguistics

Special education majors are encouraged to take Communicative Sciences and Disorders 333, which is also required for the Learning Disabilities area of emphasis. With a grade of at least 2.0, this course may be counted toward both the Planned Program and the Learning Disabilities requirements. Students completing the Language Arts Teaching Major may count one of the other courses toward the major, in which case 0 credits count toward the Planned Program. Communicative Sciences and Disorders 333 can be applied to the Language Arts Teaching Major, in which case 0 credits count toward the Planned Program.

(4) The following course on science in the elementary schools (3 credits):
ISE 301 Science for Elementary Schools

Integrated Science Education 301 is waived for the Integrated Science Teaching Major. Integrated Science Education 301 is a prerequisite for Teacher Education 403 and must be completed with a minimum grade of 2.0 prior to enrollment in Teacher Education 403.

(5) The following U.S. History course (4 credits):
HST 202 U.S. History to 1876

History 202 is required for the Social Studies Teaching Major, in which case 0 credits count toward the Planned Program.

(6) The following geography course (3 credits):
GEO 204 World Regional Geography

Geography 204 is required for the Social Studies Teaching Major, in which case 0 credits count toward the Planned Program.

(7) One of the following arts courses (4 credits):
IAH 208 Music and Culture (I)
IAH 209 Art, the Visual, and Culture (D)
IAH 241A Creative Arts and Humanities: Music and Society in the Modern World (D)
IAH 241C Creative Arts and Humanities: Cultural and Artistic Traditions of Europe (I)
IAH 241D Creative Arts and Humanities: Theater and Society in the West (I)
IAH 241E Creative Arts and Humanities: The Creative Process (D)
IAH 241F Creative Arts and Humanities: Traditions in World Art I (I)

Students may use IAH 208 or 209 to satisfy the IAH 201-210 degree requirement and IAH 241A, 241C, 241D, 241E or 241F
to satisfy the IAH 211-241 degree requirement. (4 credits may count toward both the Planned Program and the University’s Integrative Studies requirement in Arts and Humanities).

(8) One of the following creative arts courses (3 credits):
- MUS 463  Methods and Materials of Elementary Music 3
- TE 430  Introduction to Arts in the Classroom 3
- TE 431  Learning through Drama 3
- TE 432  Learning through Movement 3
- THR 421  Creative Dramatics 3
- THR 422  Children's Theatre 3

Language Arts Teaching Majors may apply one of these courses to the Language Arts requirements, in which case 0 credits count toward the Planned Program.

(9) The following health and physical education course (3 credits):
- KIN 355  Physical Activity and Health Education for Elementary Teachers 3

c. **Subject Matter Teaching Preparation** (36 to 58 credits)
   **Teaching Major.** Four teaching majors (language arts, social studies, integrated science, and mathematics) are available for prospective elementary school teachers. Elementary teacher candidates must choose one of the four teaching majors. These majors, which are housed in the College of Education, provide prospective elementary teachers with the opportunity to focus academic studies in a set of closely allied subject areas that are central to the core curriculum in elementary and middle schools. To enroll in one of these teaching majors, students must be admitted to the College of Education’s Elementary Teacher Certification Program.
   (1) Language Arts (36 to 46 credits)
   (2) Social Studies (49 credits)
   (3) Integrated Science (56 to 59 credits)
   (4) Mathematics (32 credits)

d. **Learning Disabilities Area of Emphasis** (19 credits):
   All of the following courses:
   - CEP 301  Literacy Instruction for Students with Mild Impairments (W) 3
   - CEP 449  Behavior Management in Special Education 3
   - CEP 451  Models of Special Education Administration and Services 3
   - CEP 452  Universal Design for Learning in the General Education Classroom 3
   - CSD 333  Oral Language Development 3
   - PSY 101  Introductory Psychology 4

Effective Summer 2016.

**JAMES MADISON COLLEGE**

1. Change the requirements for the **Bachelor of Arts** degree in James Madison College [Comparative Cultures and Politics]. The Teacher Education Council (TEC) approved this request at its January 11, 2016 meeting.

   a. Under the heading **Requirements for the Bachelor of Arts Degree in James Madison College** make the following changes:
      (1) Under the heading **Comparative Cultures and Politics** make the following changes:
         (a) In item 1. b. under the heading COMPARATIVE STUDIES add the following course:
             - MC 334  Rights, Advocacy and Activism 4
         (b) In item 1. b. under the heading TRANSNATIONAL STUDIES add the following course:
MC 334 Rights, Advocacy and Activism 4

(c) In item 1. c. change the credits of ‘ANP 429’ from ‘3’ to ‘4’.

Effective Fall 2016.

**COLLEGE OF NATURAL SCIENCE**

1. Change the requirements for the **Bachelor of Science** degree in **Neuroscience** in the College of Natural Science.

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

      (1) In item 3. j. (2) change the total credits from ‘6’ to ‘6 or 7’ and delete the following course:

         MMG 404 Human Genetics 3

         Add the following course:

         IBIO 341 Fundamental Genetics 4

      (2) In item 3. k. under the **Cellular and Developmental Neuroscience** concentration delete the following courses:

         ZOL 341 Fundamental Genetics 4
         ZOL 343 Genetics Laboratory 3
         ZOL 425 Cells and Development (W) 4

         Add the following courses:

         IBIO 341 Fundamental Genetics 4
         IBIO 343 Genetics Laboratory 3
         IBIO 425 Cells and Development (W) 4
         NEU 416 Development of the Nervous System Through the Lifespan 3
         NEU 425 Computational Modeling in Neuroscience 3
         NEU 435 Ion Channels of Excitable Membranes 3
         NEU 440 Synaptic Transmission 3
         PHM 422 Fundamentals of Neuropharmacology 3
         PHM 431 Pharmacology of Drug Addiction 3
         PHM 480 Special Problems 1 to 3

      (3) In item 3. k. under the **Cellular and Developmental Neuroscience** concentration replace the note with the following:

         Microbiology and Molecular Genetics 409, Integrative Biology 341, or Pharmacology and Toxicology 431 may not be used for requirement 3. j. (2) and this concentration. No more than 3 credits each of NEU 490 and NEU 492 may count toward this requirement. Students must have approval from the Neuroscience academic advisor to earn credit in NEU 490, NEU 492, or PHM 480 for this concentration.

      (4) In item 3. k. under the **Behavioral and Systems Neuroscience** concentration delete the following courses:

         ZOL 313 Animal Behavior 3
         ZOL 403 Integrative Neurobiology 3

         Add the following courses:

         IBIO 313 Animal Behavior 3
PART I – NEW ACADEMIC PROGRAMS AND PROGRAM CHANGES

IBIO 403 Integrative Neurobiology 3
NEU 416 Development of the Nervous System Through the Lifespan 3
NEU 425 Computational Modeling in Neuroscience 3

(5) In item 3. k. under the Behavioral and Systems Neuroscience concentration replace the note with the following:

Pharmacology and Toxicology 431 may not be used for requirement 3. j. (1) and this concentration. No more than 3 credits each of NEU 490 and NEU 492 may count toward this requirement. Students must have approval from the Neuroscience academic advisor to earn credit in NEU 490, NEU 492, PHM 480 or PSY 493 for this concentration.

(6) In item 3. k. change the name of the Cognitive Neuroscience concentration to the Cognitive and Computational Neuroscience concentration and delete the following course:

ENG 492H Honors Seminar in English 3

Add the following course:

NEU 425 Computational Modeling in Neuroscience 3

(7) In item 3. k. under the Cognitive and Computational Neuroscience concentration replace the note with the following:

No more than 3 credits each of NEU 490 and NEU 492 may count toward this requirement. Students must have approval from the Neuroscience academic advisor to earn credit in NEU 490, NEU 492, or PSY 493 for this concentration.

Effective Fall 2016.

2. Establish a Master of Science degree in Computational Mathematics, Science, and Engineering in the Department of Computational Mathematics, Science, and Engineering. The University Committee on Graduate Studies (UCGS) recommended approval of this request at its November 9, 2015 meeting.

a. Background Information:

Computational Science is the use of computational methods to solve scientific problems – a rapidly growing and evolving field. Modern research problems are often complex and require extensive computation, either to manipulate and explore vast quantities of data or to create sophisticated theoretical models, or both. At present, training in the methods of computational science is ad hoc and varies widely, and many faculty members, particularly in disciplines where computational techniques are not traditionally used, do not have the expertise to educate their students in necessary topics. Faculty discussion of this critical need at both the undergraduate and graduate levels – and the lack of a curriculum to address this need – precipitated extensive faculty discussion and the creation of this proposed master’s degree.

MSU is in the midst of a Provost-led initiative focusing on computational and data science, which involves the creation of a new Department of Computational Mathematics, Science and Engineering, the hiring of a substantial number of faculty to staff this department and lead interdisciplinary initiatives in computation-enabled science, and the creation of both undergraduate and graduate curricula that support the need to educate MSU students across the university in computational techniques and provide them a skillset that can be immediately applied to their course work and/or research, making them more desirable to employers.

The master’s degree will give students broad and deep knowledge of the fundamental techniques used in computational modeling and data science, as well as significant exposure to at least one application domain. Students who complete the master’s program will be able to: (1) analyze problems in terms of the algorithms and pre-existing computational tools required to solve a range of problems in computational and data science, and, write programs to efficiently solve the problem using cutting-edge computational hardware; (2) construct and implement models and simulations of physical, biological, and social situations, and use these models/simulations to understand
Experimental or observational data; and (3) apply discipline-focused or methodology-focused topics in computational and data science to solve problems in the student’s application domain of choice.

b. Academic Programs Catalog Text:

The Master of Science degree in Computational Mathematics, Science, and Engineering provides students broad and deep knowledge of the fundamental techniques used in computational modeling and data science, as well as significant exposure to at least one application domain.

Admission

Admission to graduate study in computational mathematics, science, and engineering is primarily to the doctoral program. Under certain circumstances, the program may consider application for admission to the master’s degree program for students who wish to earn the master’s degree in preparation for the doctoral program in computational mathematics, science, and engineering, or another doctoral program, or in pursuit of other professional goals.

To be considered for admission to the doctoral degree, a student must:
1. have a four-year bachelor's degree in any area.
2. have a strong interest in computational and/or data science.
3. have taken course work in calculus through differential equations, and have a working knowledge of linear algebra, basic statistics, and basic numerical methods.
4. be proficient in at least one programming language.

In addition to meeting the requirements of the university and of the College of Natural Science, students must meet the requirements specified below.

Requirements for the Master of Science Degree in Computational Mathematics, Science, and Engineering

A total of 30 credits is required for the degree under either Plan A (with thesis) or Plan B (without thesis). The student’s program of study must be approved by the student’s guidance committee and must meet the requirements specified below.

CREDITS

Requirements for Both Plan A and Plan B

1. Complete three of the following courses (9 credits):
   - CMSE 820 Mathematical Foundations of Data Science 3
   - CMSE 821 Numerical Methods for Differential Equations 3
   - CMSE 822 Parallel Computing 3
   - CMSE 823 Numerical Linear Algebra, I 3

   Additional details on applicable course work can be found in the CMSE graduate handbook at www.cmse.msu.edu.

2. Complete additional course work in one or more cognate areas chosen in consultation with the student’s guidance committee as specified in the CMSE graduate handbook at www.cmse.msu.edu.

3. All students must complete Responsible Conduct of Research Training.

Additional Requirements for Plan A:

1. The following course:
   - CMSE 899 Master’s Thesis Research 4 to 8

2. Successful completion and defense of a thesis based on original research on a problem in computational and/or data science. The thesis research will culminate in a written thesis to be submitted to, and accepted by, a guidance committee. An oral examination of the student’s work may be required.

Additional Requirements for Plan B:

1. Completion of additional course work determined in consultation with the student’s guidance committee.

2. Completion of a final examination or evaluation.

Effective Fall 2016
3. Establish a **Doctor of Philosophy** degree in **Computational Mathematics, Science, and Engineering** in the Department of Computational Mathematics, Science, and Engineering. The University Committee on Graduate Studies (UCGS) recommended approval of this request at its November 9, 2015 meeting.

   a. **Background Information:**

   Computational Science is the use of computational methods to solve scientific problems – a rapidly growing and evolving field. Modern research problems are often complex and require extensive computation, either to manipulate and explore vast quantities of data or to create sophisticated theoretical models, or both. At present, training in the methods of computational science is ad hoc and varies widely, and many faculty members, particularly in disciplines where computational techniques are not traditionally used, do not have the expertise to educate their students in necessary topics. Faculty discussion of this critical need at both the undergraduate and graduate levels – and the lack of a curriculum to address this need – precipitated extensive faculty discussion and the creation of this proposed doctoral degree.

   MSU is in the midst of a Provost-led initiative focusing on computational and data science, which involves the creation of a new Department of Computational Mathematics, Science and Engineering, the hiring of a substantial number of faculty to staff this department and lead interdisciplinary initiatives in computation-enabled science, and the creation of both undergraduate and graduate curricula that support the need to educate MSU students across the university in computational techniques and provide them a skillset that can be immediately applied to their course work and/or research, making them more desirable to employers.

   The doctoral degree will give students broad and deep knowledge of the fundamental techniques used in computational modeling and data science, as well as significant exposure to at least one application domain, and to conduct significant original research in algorithms and/or applications relating to computational and data science. Students who complete the doctoral program will be able to: (1) analyze problems in terms of the algorithms and pre-existing computational tools required to solve a range of problems in computational and data science, and write programs to efficiently solve the problem using cutting-edge computational hardware; (2) construct and implement models and simulations of physical, biological, and social situations, and use these models/simulations to understand experimental or observational data; (3) apply discipline-focused or methodology-focused topics in computational and data science to solve problems in the student's application domain of choice; and (4) conduct significant original research and present it in peer-reviewed articles, a written dissertation, and orally in a variety of venues.

   b. **Academic Programs Catalog Text:**

   The Doctor of Philosophy degree in Computational Mathematics, Science, and Engineering provides students broad and deep knowledge of the fundamental techniques used in computational modeling and data science, as well as significant exposure to at least one application domain, and to conduct significant original research in algorithms and/or applications relating to computational and data science.

   **Admission**

   Admission to graduate study in computational mathematics, science, and engineering is primarily to the doctoral program.

   To be considered for admission to the doctoral degree, a student must:
   1. have a four-year bachelor’s degree in any area.
   2. have a strong interest in computational and/or data science.
   3. have taken course work in calculus through differential equations, and have a working knowledge of linear algebra, basic statistics, and basic numerical methods.
   4. be proficient in at least one programming language.

   In addition to meeting the requirements of the university and of the College of Natural Science, students must meet the requirements specified below.

   **Requirements for the Doctor of Philosophy Degree in Computational Mathematics, Science, and Engineering**

   The student’s program of study must be approved by the student’s guidance committee and must meet the requirements specified below.
PART I – NEW ACADEMIC PROGRAMS AND PROGRAM CHANGES

CREDITS

1. Complete the following courses (12 credits):
   CMSE 820 Mathematical Foundations of Data Science 3
   CMSE 821 Numerical Methods for Differential Equations 3
   CMSE 822 Parallel Computing 3
   CMSE 823 Numerical Linear Algebra, I 3
   Additional details on applicable course work can be found in the CMSE graduate handbook at www.cmse.msu.edu.

2. Complete additional course work to total a minimum of 30 credits beyond the bachelor’s degree in one or more cognate areas chosen in consultation with the student’s guidance committee as specified in the CMSE graduate handbook at www.cmse.msu.edu.

3. Complete at least 24 credits and no more than 36 credits of CMSE 999 Doctoral Dissertation Research.

4. Pass a written or practical qualifying examination.

5. Pass an oral or written comprehensive examination no less than six months before the defense of the student’s dissertation.

6. Successfully defend the doctoral dissertation based on original research in algorithms pertaining to, or applications of computational and data science.

7. All students must complete Responsible Conduct of Research Training.

Effective Fall 2016

4. Establish a Graduate Certificate in Computational Modeling in the Department of Computational Mathematics, Science, and Engineering. The University Committee on Graduate Studies (UCGS) recommended approval of this request at its November 9, 2015 meeting.

a. Background Information:

   Computational Science is the use of computational methods to solve scientific problems – a rapidly growing and evolving field. Modern research problems are often complex and require extensive computation, either to manipulate and explore vast quantities of data or to create sophisticated theoretical models, or both. At present, training in the methods of computational science is ad hoc and varies widely, and many faculty members, particularly in disciplines where computational techniques are not traditionally used, do not have the expertise to educate their students in necessary topics. Faculty discussion of this critical need at both the undergraduate and graduate levels – and the lack of a curriculum to address this need – precipitated extensive faculty discussion and the creation of this proposed graduate certificate.

   MSU is in the midst of a Provost-led initiative focusing on computational and data science, which involves the creation of a new Department of Computational Mathematics, Science and Engineering, the hiring of a substantial number of faculty to staff this department and lead interdisciplinary initiatives in computation-enabled science, and the creation of both undergraduate and graduate curricula that support the need to educate MSU students across the university in computational techniques and provide them a skillset that can be immediately applied to their course work and/or research, making them more desirable to employers.

   This certificate will complement graduate students’ degree programs with a set of courses that achieve several outcomes. Students that have achieved the goals of the Graduate Certificate in Computational Modeling will be able to: (1) demonstrate a basic understanding of functional computer programming as applied to a range of problems in computational and data science; (2) analyze problems in terms of the algorithms and pre-existing computational tools required to solve a range of problems in computational and data science, and write a program to efficiently solve the problem; (3) construct and implement models and simulations of physical, biological, and social situations, and use these models/simulations to understand experimental or observational data; and (4) apply some subset of discipline-focused or methodology-focused topics in computational and data science to solve problems in the student’s primary discipline.

b. Academic Programs Catalog Text:

   The Graduate Certificate in Computational Modeling is intended for students with interest in applying computational and data science approaches to their research problems, or who generally desire broad training in computational modeling and methodology.
### Requirements for the Graduate Certificate in Computational Modeling

Students must complete a minimum of 9 credits from the following:

1. Two of the following core courses (6 credits):
   - CMSE 801 Introduction to Computational Modeling 3
   - CMSE 802 Methods in Computational Modeling 3
   - CMSE 820 Mathematical Foundations of Data Science 3
   - CMSE 821 Numerical Methods for Differential Equations 3
   - CMSE 822 Parallel Computing 3
   - CMSE 823 Numerical Linear Algebra I 3

2. One or more additional courses selected from the following:
   - AST 911 Numerical Techniques in Astronomy 2
   - CEM 883 Computational Quantum Chemistry 3
   - CEM 888 Computational Chemistry 3
   - CMSE 801 Introduction to Computational Modeling 3
   - CMSE 802 Methods in Computational Modeling 3
   - CMSE 820 Mathematical Foundations of Data Science 3
   - CMSE 821 Numerical Methods for Differential Equations 3
   - CMSE 822 Parallel Computing 3
   - CMSE 823 Numerical Linear Algebra I 3
   - CSE 836 Probabilistic Models and Algorithms in Computational Biology 3
   - CSE 845 Multi-disciplinary Research Methods for the Study of Evolution 3
   - CSE 881 Data Mining 3
   - ECE 837 Computational Methods in Electromagnetics 3
   - ME 835 Turbulence Modeling and Simulation 3
   - ME 840 Computational Fluid Dynamics and Heat Transfer 3
   - ME 872 Finite Element Method 3
   - MTH 451 Numerical Analysis I 3
   - MTH 452 Numerical Analysis II 3
   - MTH 850 Numerical Analysis I 3
   - MTH 851 Numerical Analysis II 3
   - MTH 852 Numerical Methods for Ordinary Differential Equations 3
   - MTH 950 Numerical Methods for Partial Differential Equations I 3
   - MTH 951 Numerical Methods for Partial Differential Equations II 3
   - MTH 995 Special Topics in Numerical Analysis and Operations Research 3 to 6
   - PHY 480 Computational Physics 3
   - PHY 915 Computational Condensed Matter Physics 2
   - PHY 919 Modern Electronic Structure Theory 2
   - PHY 950 Data Analysis Methods for High-Energy and Nuclear Physics 2
   - PHY 998 High Performance Computing and Computational Tools for Nuclear Physics 2
   - PLB 810 Theories and Practices in Bioinformatics 3
   - QB 826 Introduction to Quantitative Biology Techniques 1
   - STT 461 Computations in Probability and Statistics 3
   - STT 465 Bayesian Statistical Methods 3
   - STT 802 Statistical Computation 3
   - STT 874 Introduction to Bayesian Analysis 3

Courses used to fulfill requirement 1. may not be used to fulfill this requirement. Additional courses at the 400-level or above may be used to fulfill this requirement if approved by the CMSE graduate advisor. Students must have a minimum 3.0 grade-point average in courses applied to the certificate in order for it to be awarded.

Effective Fall 2016
5. Establish a **Graduate Certificate in High-Performance Computing** in the Department of Computational Mathematics, Science, and Engineering. The University Committee on Graduate Studies (UCGS) recommended approval of this request at its November 9, 2015 meeting.

   a. **Background Information:**

   Computational Science is the use of computational methods to solve scientific problems – a rapidly growing and evolving field. Modern research problems are often complex and require extensive computation, either to manipulate and explore vast quantities of data or to create sophisticated theoretical models, or both. At present, training in the methods of computational science is ad hoc and varies widely, and many faculty members, particularly in disciplines where computational techniques are not traditionally used, do not have the expertise to educate their students in necessary topics. Faculty discussion of this critical need at both the undergraduate and graduate levels – and the lack of a curriculum to address this need – precipitated extensive faculty discussion and the creation of this proposed graduate certificate.

   MSU is in the midst of a Provost-led initiative focusing on computational and data science, which involves the creation of a new Department of Computational Mathematics, Science and Engineering, the hiring of a substantial number of faculty to staff this department and lead interdisciplinary initiatives in computation-enabled science, and the creation of both undergraduate and graduate curricula that support the need to educate MSU students across the university in computational techniques and provide them a skillset that can be immediately applied to their course work and/or research, making them more desirable to employers.

   This certificate will complement graduate students’ degree programs with a set of courses that achieve several outcomes. Students that have achieved the goals of the Graduate Certificate in Computational Modeling will be able to: (1) demonstrate a high-level understanding of functional and object-oriented computer programming as applied to a range of problems in computational and data science; (2) analyze problems in terms of the algorithms and pre-existing computational tools required to solve a range of problems in computational and data science, and write a program to efficiently solve the problem on modern parallel computers and specialized hardware; (3) construct and implement models of a variety of systems using modern parallel programming techniques and software development techniques, and use these models/simulations to gain understanding of these systems; and (4) apply some subset of discipline-focused or methodology-focused topics in computational and data science to solve problems in the student’s primary discipline.

   b. **Academic Programs Catalog Text:**

   The Graduate Certificate in High-Performance Computing is intended for students with interest in applying computational and data science approaches that require parallel and/or high-performance computing to their research problems, or who generally desire broad training in parallel computational methodology.

   **Requirements for the Graduate Certificate in High-Performance Computing**

   Students must complete a minimum of 9 credits from the following:

   1. The following core course (3 credits):
      
      CMSE 822 Parallel Computing 3

   2. Two or more additional courses selected from the following:
      
      AST 911 Numerical Techniques in Astronomy 2
      CEM 883 Computational Quantum Chemistry 3
      CEM 888 Computational Chemistry 3
      CSE 836 Probabilistic Models and Algorithms in Computational Biology 3
      CSE 845 Multi-disciplinary Research Methods for the Study of Evolution 3
      CSE 881 Data Mining 3
      ECE 837 Computational Methods in Electromagnetics 3
      ME 835 Turbulence Modeling and Simulation 3
      ME 840 Computational Fluid Dynamics and Heat Transfer 3
      ME 872 Finite Element Method 3
      MTH 850 Numerical Analysis I 3
      MTH 851 Numerical Analysis II 3
      MTH 852 Numerical Methods for Ordinary Differential Equations 3
### PART I – NEW ACADEMIC PROGRAMS AND PROGRAM CHANGES

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MTH 950</td>
<td>Numerical Methods for Partial Differential Equations I</td>
<td>3</td>
</tr>
<tr>
<td>MTH 951</td>
<td>Numerical Methods for Partial Differential Equations II</td>
<td>3</td>
</tr>
<tr>
<td>MTH 995</td>
<td>Special Topics in Numerical Analysis and Operations Research</td>
<td>3 to 6</td>
</tr>
<tr>
<td>PHY 915</td>
<td>Computational Condensed Matter Physics</td>
<td>2</td>
</tr>
<tr>
<td>PHY 919</td>
<td>Modern Electronic Structure Theory</td>
<td>2</td>
</tr>
<tr>
<td>PHY 950</td>
<td>Data Analysis Methods for High-Energy and Nuclear Physics</td>
<td>2</td>
</tr>
<tr>
<td>PHY 998</td>
<td>High Performance Computing and Computational Tools for Nuclear Physics</td>
<td>2</td>
</tr>
<tr>
<td>PLB 810</td>
<td>Theories and Practices in Bioinformatics</td>
<td>3</td>
</tr>
<tr>
<td>QB 826</td>
<td>Introduction to Quantitative Biology Techniques</td>
<td>1</td>
</tr>
<tr>
<td>STT 802</td>
<td>Statistical Computation</td>
<td>3</td>
</tr>
<tr>
<td>STT 874</td>
<td>Introduction to Bayesian Analysis</td>
<td>3</td>
</tr>
</tbody>
</table>

Additional courses at the 800-level or above may be used to fulfill this requirement if approved by the CMSE graduate advisor. Students must have a minimum 3.0 grade-point average in courses applied to the certificate in order for it to be awarded.

---

**Effective Fall 2016**

6. Change the administrative responsibility for the Bachelor of Science degree in Environmental Biology/Zoology in the Department of Zoology to the Department of Integrative Biology. This department name change was effective July 1, 2015.

**Effective Fall 2016.**

7. Change the requirements for the Bachelor of Science degree in Environmental Biology/Zoology in the Department of Zoology.

a. Under the heading Requirements for the Bachelor of Science Degree in Environmental Biology/Zoology replace the entire entry with the following:

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 Environmental Biology/Zoology.

The University’s Tier II writing requirement for the Environmental Biology/Zoology major is met by completing two of the following courses: Integrative Biology 328, 353, 355L, 384, 415, 425, 445, 450, 483; 485. Those courses are referenced in requirement 3. 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.

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.

The following requirements for the major:

a. One of the following groups of courses (9 or 10 credits):

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BS 161</td>
<td>Cell and Molecular Biology</td>
<td>3</td>
</tr>
<tr>
<td>BS 162</td>
<td>Organismal and Population Biology</td>
<td>3</td>
</tr>
<tr>
<td>BS 171</td>
<td>Cell and Molecular Biology Laboratory</td>
<td>2</td>
</tr>
<tr>
<td>BS 172</td>
<td>Organismal and Population Biology Laboratory</td>
<td>2</td>
</tr>
<tr>
<td>BS 181H</td>
<td>Honors Cell and Molecular Biology</td>
<td>3</td>
</tr>
<tr>
<td>BS 182H</td>
<td>Honors Organismal and Population Biology</td>
<td>3</td>
</tr>
<tr>
<td>BS 191H</td>
<td>Honors Cell and Molecular Biology Laboratory</td>
<td>2</td>
</tr>
</tbody>
</table>
### PART I – NEW ACADEMIC PROGRAMS AND PROGRAM CHANGES

**BS 192H** Honors Organismal and Population Biology Laboratory 2

(b) One of the following groups of courses (5 or 6 credits):

1. CEM 141 General Chemistry 4
2. CEM 161 Chemistry Laboratory I 1
3. CEM 181H Honors Chemistry I 4
4. CEM 185H Honors Chemistry Laboratory I 2
5. LB 171 Principles of Chemistry I 4
6. LB 171L Introductory Chemistry I Laboratory 1

(c) One course from each of the following groups of courses (6 credits):

1. CEM 251 Organic Chemistry I 3
2. CEM 351 Organic Chemistry I 3
3. CEM 252 Organic Chemistry II 3
4. CEM 352 Organic Chemistry II 3
5. CEM 255 Organic Chemistry Laboratory 2
6. CEM 355 Organic Laboratory I 2

(d) One of the following groups of courses (8 to 10 credits):

1. PHY 231 Introductory Physics I 3
2. PHY 232 Introductory Physics II 3
3. PHY 251 Introductory Physics Laboratory I 1
4. PHY 252 Introductory Physics Laboratory II 1
5. PHY 183 Physics for Scientists and Engineers I 4
6. PHY 184 Physics for Scientists & Engineers II 4
7. LB 273 Physics I 4
8. LB 274 Physics II 4

(e) One of the following courses (3 or 4 credits):

1. MTH 124 Survey of Calculus I 3
2. MTH 132 Calculus I 3
3. MTH 152H Honors Calculus I 3
4. LB 118 Calculus I 4

(f) One of the following courses (3 or 4 credits):

1. MTH 126 Survey of Calculus II 3
2. MTH 133 Calculus II 4
3. MTH 153H Honors Calculus II 3
4. LB 119 Calculus II 4
5. STT 201 Statistical Methods 4
6. STT 224 Introduction to Probability and Statistics for Ecologists 3
7. STT 231 Statistics for Scientists 3
8. STT 421 Statistics I 3

(g) All of the following courses (25 credits):

1. CSS 210 Fundamentals of Soil Science 3
2. IBIO 306 Invertebrate Biology 4
3. IBIO 341 Fundamental Genetics 4
4. IBIO 355 Ecology 3
5. IBIO 355L Ecology Laboratory (W) 1
6. IBIO 445 Evolution (W) 3
7. IBIO 483 Environmental Physiology (W) 4
8. PLB 441 Plant Ecology 3

*Entomology 404 may be substituted for Integrative Biology 306.*

*Forestry 404 may be substituted for Plant Biology 441.*

(h) One course or pair of courses from each of the following four groups of courses (13 to 15 credits):

1. FW 471 Ichthyology 4
2. IBIO 360 Biology of Birds 4
3. IBIO 365 Biology of Mammals 4
4. IBIO 384 Biology of Amphibians and Reptiles (W) 4
5. PLB 218 Plants of Michigan 3
6. PLB 418 Plant Systematics 3
7. FW 420 Stream Ecology 3
8. GEO 221 Introduction to Geographic Information 3
9. GEO 221L Introduction to Geographic Information Laboratory 1
GEO 324 Remote Sensing of the Environment 4
IBIO 353 Marine Biology (W) 4
IBIO 485 Tropical Biology (W) 3
PLB 424 Algal Biology 4
Both Geography 221 and 221L must be completed to satisfy this requirement.

FW 416 Marine Ecosystem Management 3
FW 472 Limnology 3
GLG 421 Environmental Geochemistry 4
IBIO 357 Global Change Biology (W) 3
IBIO 446 Environmental Issues and Public Policy 3

Effective Fall 2016.

8. Change the administrative responsibility for the Bachelor of Arts degree in Zoology in the Department of Zoology to the Department of Integrative Biology. This department name change was effective July 1, 2015.

Effective Fall 2016.

9. Change the requirements for the Bachelor of Arts degree in Zoology in the Department of Integrative Biology.

a. Under the heading Requirements for the Bachelor of Arts Degree in Zoology replace the entire entry with the following:

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 Arts degree in Zoology.

The University’s Tier II writing requirement for the Zoology major is met by completing two of the following courses: Integrative Biology 328, 353, 355L, 384, 415, 425, 445, 450, 483, and 485. Those courses are referenced in item 3. below.

Students who are enrolled in the College of Natural Science may complete the alternative track to Integrative Studies in Biological and Physical Science 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 Arts 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:

a. One of the following groups of courses (9 or 10 credits):

(1) BS 161 Cell and Molecular Biology 3
BS 162 Organismal and Population Biology 3
BS 171 Cell and Molecular Biology Laboratory 2
BS 172 Organismal and Population Biology Laboratory 2

(2) BS 181H Honors Cell and Molecular Biology 3
BS 182H Honors Organismal and Population Biology 3
BS 191H Honors Cell and Molecular Biology Laboratory 2
BS 192H Honors Organismal and Population Biology Laboratory 2

(3) LB 144 Biology I: Organismal Biology 4
LB 145 Biology II: Cellular and Molecular Biology 5

b. One of the following groups of courses (5 or 6 credits):

(1) CEM 141 General Chemistry 4
CEM 161 Chemistry Laboratory I 1
**PART I – NEW ACADEMIC PROGRAMS AND PROGRAM CHANGES**

1. (2) CEM 181H Honors Chemistry I 4
   CEM 185H Honors Chemistry Laboratory I 2
   (3) LB 171 Principles of Chemistry I 4
   LB 171L Introductory Chemistry Laboratory I 1

c. Complete the following course (4 credits):
   CEM 143 Survey of Organic Chemistry 4

d. One of the following courses (3 or 4 credits):
   PHY 183 Physics for Scientists and Engineers I 4
   PHY 231 Introductory Physics I 3
   LB 273 Physics I 4
   PHY 193H Honors Physics I-Mechanics 4

e. One of the following courses (3 or 4 credits):
   LB 118 Calculus I 4
   MTH 124 Survey of Calculus I 3
   MTH 132 Calculus I 3
   MTH 152H Honors Calculus I 3

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 4
   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 (11 credits):
   IBIO 341 Fundamental Genetics 4
   IBIO 355 Ecology 3
   IBIO 355L Ecology Laboratory (W) 1
   IBIO 445 Evolution (W) 3

h. Three additional courses in 300-400 level Integrative Biology courses. Students are encouraged to consult with their academic advisor to identify courses which match their career goals. Courses from other departments may be applied to this requirement with the approval of the student’s academic advisor.

i. Complete one course from each of the following three groups of courses (9 to 11 credits):
   (1) **Writing** (3 credits):
      CSUS 433 Grant Writing and Fund Development (W) 3
      WRA 320 Technical Writing (W) 3
      WRA 331 Writing in the Public Interest (W) 3
      WRA 341 Nature, Environmental, and Travel Writing 3
      WRA 453 Grant and Proposal Writing 3
   (2) **Communications** (3 or 4 credits):
      COM 100 Human Communication 3
      COM 225 An Introduction to Interpersonal Communication 3
      COM 240 Introduction to Organizational Communication 4
      COM 275 Effects of Mass Communication 3
      COM 300 Methods of Communication Inquiry 4
      CSUS 325 Study and Practice of Communication for Sustainability (W) 3
      FW 435 Integrated Communications for the Fisheries and Wildlife Professional 3
   (3) **Computer Systems** (3 or 4 credits):
      CSE 101 Computing Concepts and Competencies 3
      CSE 201 Fundamentals of Information Technology 3
      CSE 231 Introduction to Programming 3
      FW 419 Applications of Geographic Information Systems to Natural Resource Management 4
GEO 221  Introduction to Geographic Information  3  
GEO 221L  Introduction to Geographic Information Laboratory  1  
GEO 324  Remote Sensing of the Environment  4  
GEO 325  Geographic Information Systems  3  
NSC 204  Introduction to Computational Modeling  4  
Both Geography 221 and 221L must be completed to satisfy this requirement.

j. Six credits in 300-400 level courses offered by the Colleges of Arts and Letters or College of Social Science beyond the credits that are counted toward the University's Integrative Studies requirement. Credits from relevant courses completed from item 3. i. may be counted toward this requirement. Courses used to fulfill this requirement must be approved by the student's academic advisor.

k. Additional credits in 300-400 level Integrative Biology courses as needed to meet the requirement of at least 33 credits. Students also may complete more than one course, or pair of courses, from item 3. i. Additional courses completed from item 3. i. 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.

10. Change the administrative responsibility for the Bachelor of Science degree in Zoology in the Department of Zoology to the Department of Integrative Biology. This department name change was effective July 1, 2015.

Effective Fall 2016.

11. Change the requirements for the Bachelor of Science degree in Zoology.

The concentrations in the Bachelor of Science degree in Zoology are 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 Zoology replace the entire entry with the following:

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 Zoology.

The University’s Tier II writing requirement for the Zoology major is met by completing Integrative Biology 355L and 445. Those courses are referenced in item 3. 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:

a. One of the following groups of courses (9 or 10 credits):

(1) BS 161 Cell and Molecular Biology  3
(2) BS 162 Organismal and Population Biology  3
(3) BS 171 Cell and Molecular Biology Laboratory  2
**PART I – NEW ACADEMIC PROGRAMS AND PROGRAM CHANGES**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BS 172</td>
<td>Organismal and Population Biology Laboratory</td>
<td>2</td>
</tr>
<tr>
<td>(2) BS 181H</td>
<td>Honors Cell and Molecular Biology</td>
<td>3</td>
</tr>
<tr>
<td>BS 182H</td>
<td>Honors Organismal and Population Biology</td>
<td>3</td>
</tr>
<tr>
<td>BS 191H</td>
<td>Honors Cell and Molecular Biology Laboratory</td>
<td>2</td>
</tr>
<tr>
<td>BS 192H</td>
<td>Honors Organismal and Population Biology Laboratory</td>
<td>2</td>
</tr>
<tr>
<td>(3) LB 144</td>
<td>Biology I: Organismal Biology</td>
<td>4</td>
</tr>
<tr>
<td>LB 145</td>
<td>Biology II: Cellular and Molecular Biology</td>
<td>5</td>
</tr>
</tbody>
</table>

b. One of the following groups of courses (5 or 6 credits):

1. CEM 141 General Chemistry 4
2. CEM 161 Chemistry Laboratory I 1
3. CEM 181H Honors Chemistry I 4
4. CEM 185H Honors Chemistry Laboratory I 2
5. LB 171 Principles of Chemistry I 4
6. LB 171L Introductory Chemistry Laboratory I 1

c. One course from each of the following groups of courses (8 credits):

1. CEM 251 Organic Chemistry I 3
2. CEM 252 Organic Chemistry II 3
3. CEM 351 Organic Chemistry I 3
4. CEM 352 Organic Chemistry II 3
5. CEM 255 Organic Chemistry Laboratory 2
6. CEM 355 Organic Laboratory I 2

d. One of the following groups of courses (8 credits):

1. PHY 231 Introductory Physics I 3
2. PHY 232 Introductory Physics II 3
3. PHY 251 Introductory Physics Laboratory I 1
4. PHY 252 Introductory Physics Laboratory II 1
5. PHY 183 Physics for Scientists and Engineers I 4
6. PHY 184 Physics for Scientists and Engineers II 4
7. LB 273 Physics I 4
8. LB 274 Physics II 4

(4) PHY 193H Honors Physics I-Mechanics 4
9. PHY 294H Honors Physics II-Electromagnetism 4

e. One of the following courses (3 or 4 credits):

1. LB 118 Calculus I 4
2. MTH 124 Survey of Calculus I 3
3. MTH 132 Calculus I 3
4. MTH 152H Honors Calculus I 3

f. One of the following courses (3 or 4 credits):

1. LB 119 Calculus II 4
2. MTH 126 Survey of Calculus II 3
3. MTH 133 Calculus II 4
4. MTH 153H Honors Calculus II 4
5. STT 201 Statistical Methods 4
6. STT 224 Introduction to Probability and Statistics for Ecologists 3
7. STT 231 Statistics for Scientists 3
8. STT 421 Statistics I 3

One of the following concentrations:

**Animal Behavior and Neurobiology**

(1) All of the following courses (17 credits):

1. IBIO 313 Animal Behavior 3
2. IBIO 341 Fundamental Genetics 4
3. IBIO 355 Ecology 3
4. IBIO 355L Ecology Laboratory (W) 1
5. IBIO 415 Ecological Aspects of Animal Behavior (W) 3
6. IBIO 445 Evolution (W) 3

(2) One of the following courses (3 credits):

1. IBIO 402 Neurobiology 3
2. IBIO 405 Neural Basis of Animal Behavior 3

(3) One of the following courses (4 credits):

1. IBIO 306 Invertebrate Biology 4
2. IBIO 328 Comparative Anatomy and Biology of Vertebrates (W) 4
### PART I – NEW ACADEMIC PROGRAMS AND PROGRAM CHANGES

#### (4) One of the following courses (3 or 4 credits):

- ANS 305 Applied Animal Behavior 3
- ANS 405 Endocrinology of Reproduction 4
- ANS 455 Avian Physiology 4
- FW 364 Ecological Problem Solving 3
- FW 419 Applications of Geographic Information Systems to Natural Resources Management 4
- GEO 221 Introduction to Geographic Information 3
- GEO 221L Introduction to Geographic Information Laboratory 1
- GEO 324 Remote Sensing of the Environment 4
- GEO 325 Geographic Information Systems 3
- IBIO 320 Developmental Biology 4
- IBIO 483 Environmental Physiology (W) 4
- LIN 463 Introduction to Cognitive Science 3
- PSY 301 Cognitive Neuroscience 3
- PSY 402 Sensation and Perception (W) 3
- PSY 409 Psychobiology of Behavioral Development (W) 3
- PSY 411 Hormones and Behavior (W) 3
- PSY 413 Laboratory in Behavioral Neuroscience (W) 4
- SOC 412 Animals, People and Nature 3

Both GEO 221 and 221L must be completed to satisfy this requirement.

#### (5) 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 items (2), (3) or (4). Additional courses completed from items (2), (3) or (4) may be counted as Zoology electives toward the 33 credits. Courses beyond those taken to satisfy items (1), (2), (3) or (4) may come from other departments with the approval of the student’s academic advisor.

### Cell and Developmental Biology

#### (1) All of the following courses (11 credits):

- IBIO 341 Fundamental Genetics 4
- IBIO 355 Ecology 3
- IBIO 355L Ecology Laboratory (W) 1
- IBIO 445 Evolution (W) 3

#### (2) One of the following courses (4 credits):

- IBIO 320 Developmental Biology 4
- IBIO 425 Cells and Development (W) 4

#### (3) Eighteen credits from the following courses:

- BMB 401 Comprehensive Biochemistry 4
- MMG 301 Introductory Microbiology 3
- MMG 302 Introductory Laboratory for General and Allied Health Microbiology 1
- MMG 404 Human Genetics 3
- MMG 409 Eukaryotic Cell Biology 3
- IBIO 328 Comparative Anatomy and Biology of Vertebrates (W) 4
- IBIO 343 Genetics Laboratory 3
- IBIO 402 Neurobiology 3
- IBIO 408 Histology 4
- IBIO 450 Cancer Biology (W) 3

Biochemistry and Molecular Biology 461 and 462 combined, may be substituted for Biochemistry and Molecular Biology 401. If Integrative Biology 320 and 425 are both completed in item (2), students only need to complete 14 credits in course work to fulfill this requirement.

### Ecology, Evolution, and Organismal Biology

#### (1) All of the following courses (11 credits):

- IBIO 341 Fundamental Genetics 4
IBIO 355 Ecology 3
IBIO 355L Ecology Laboratory (W) 1
IBIO 445 Evolution (W) 3

(2) One of the following courses (4 credits):
IBIO 306 Invertebrate Biology 4
IBIO 328 Comparative Anatomy and Biology of Vertebrates (W) 4

(3) One of the following courses (3 or 4 credits):
IBIO 313 Animal Behavior 3
IBIO 316 General Parasitology 3
IBIO 357 Global Change Biology (W) 3
IBIO 483 Environmental Physiology (W) 4
IBIO 485 Tropical Biology (W) 3

(4) One of the following courses, or pair of courses (3 or 4 credits):
FW 419 Applications of Geographic Information Systems to Natural Resources Management 4
GEO 221 Introduction to Geographic Information 3
And GEO 221L Introduction to Geographic Information Laboratory 1
GEO 324 Remote Sensing of the Environment 4
GEO 325 Geographic Information Systems 3
GLG 434 Evolutionary Paleobiology 4
IBIO 446 Environmental Issues and Public Policy 3
PLB 418 Plant Systematics 3
Both Geography 221 and 221L must be completed to satisfy this requirement.

(5) 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 items (2), (3), or (4). Additional courses completed from items (2), (3), or (4) may be counted as Integrative Biology electives toward the 33 credits. Courses beyond those taken to satisfy items (1), (2), (3), or (4) may come from other departments with the approval of the student’s academic advisor.

Genetics (33 credits):
(1) All of the following courses (23 credits):
BMB 461 Advanced Biochemistry I 3
BMB 462 Advanced Biochemistry II 3
MMG 431 Microbial Genetics 3
IBIO 341 Fundamental Genetics 4
IBIO 343 Genetics Laboratory 3
IBIO 355 Ecology 3
IBIO 355L Ecology Laboratory (W) 1
IBIO 445 Evolution (W) 3

(2) One of the following courses (3 or 4 credits):
BMB 472 Advanced Molecular Biology Laboratory 3
IBIO 425 Cells and Development (W) 4

(3) A minimum of 4 credits completed in a genetics laboratory or field experience arranged in consultation with the student’s academic advisor.

(4) 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 items (2) and (3). Additional courses completed from items (2) and (3) may be counted as Integrative Biology electives toward the 33 credits. Courses beyond those taken to satisfy items (1), (2), and (3) may come from other departments with the approval of the student’s academic advisor.

General Zoology
(1) All of the following courses (11 credits):
IBIO 341 Fundamental Genetics 4
IBIO 355 Ecology 3
IBIO 355L Ecology Laboratory (W) 1
PART I – NEW ACADEMIC PROGRAMS AND PROGRAM CHANGES

IBIO 445  Evolution (W)  3

(2) One of the following courses (4 credits)
IBIO 306  Invertebrate Biology  4
IBIO 328  Comparative Anatomy and Biology of Vertebrates (W)  4

(3) One of the following courses (3 or 4 credits)
IBIO 313  Animal Behavior  3
IBIO 483  Environmental Physiology (W)  4

(4) One of the following courses (3 or 4 credits)
MMG 409  Eukaryotic Cell Biology  3
IBIO 320  Developmental Biology  4
IBIO 408  Histology  4
IBIO 425  Cells and Development (W)  4

(5) A minimum of 4 laboratory courses at the 300-400 level selected from the following:
ANS 313  Principles of Animal Feeding and Nutrition  4
MMG 302  Introductory Laboratory for General and Allied Health Microbiology  1
IBIO 306  Invertebrate Biology  4
IBIO 320  Developmental Biology  4
IBIO 328  Comparative Anatomy and Biology of Vertebrates (W)  4
IBIO 343  Genetics Laboratory  3
IBIO 355L  Ecology Laboratory (W)  1
IBIO 360  Biology of Birds  4
IBIO 365  Biology of Mammals  4
IBIO 384  Biology of Amphibians and Reptiles (W)  4
IBIO 408  Histology  4
IBIO 425  Cells and Development (W)  4

Laboratory courses taken to satisfy items (1), (2), (4) may also be applied to this requirement.

(6) 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 items (2), (3), and (4). Additional courses completed from items (2), (3) or (4) may be counted as Integrative Biology electives toward the 33 credits. Courses beyond those taken to satisfy items (1), (2), (3), (4) or (5) may come from other departments with the approval of the student’s academic advisor.

Marine Biology

(1) All of the following courses (23 credits):
IBIO 303  Oceanography  4
IBIO 341  Fundamental Genetics  4
IBIO 353  Marine Biology (W)  4
IBIO 355  Ecology  3
IBIO 355L  Ecology Laboratory (W)  1
IBIO 445  Evolution (W)  3
IBIO 483  Environmental Physiology (W)  4

(2) One course from each of the following groups of courses (7 or 8 credits):
(a) FW 471  Ichthyology  4
IBIO 306  Invertebrate Biology  4
(b) BMB 401  Comprehensive Biochemistry  4
CEM 383  Introductory Physical Chemistry I  3
FW 416  Marine Ecosystem Management  3
FW 424  Population Analysis and Management  4
GEO 221  Introduction to Geographic Information  3
and
GEO 221L  Introduction to Geographic Information Laboratory  1
GEO 324  Remote Sensing of the Environment  4
IBIO 357  Global Change Biology (W)  3
Both Geography 221 and 221L must be completed to satisfy this requirement.

(3) A minimum of at least 1 credit must be completed in an aquatic biology field experience. Through consultation with their academic advisor, students may determine an appropriate aquatic biology field experience or choose one of the following courses (3 or 4 credits):
- **ENT 469 Biomonitoring of Streams and Rivers**  3
- **FW 474 Field and Laboratory Techniques for Aquatic Studies**  3
- **IBIO 440 Field Ecology and Evolution**  4
- **PLB 424 Algal Biology**  4

Courses not listed above must have the approval of the student's academic advisor.

(4) 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 (2). Additional courses completed from item (2) may be counted as Zoology electives toward the 33 credits. Courses beyond those taken to satisfy items (1), (2), or (3) may come from other departments with the approval of the student’s academic advisor.

**Zoo and Aquarium Science**

(1) All of the following courses (31 credits):
- **IBIO 313 Animal Behavior**  3
- **IBIO 320 Developmental Biology**  4
- **IBIO 328 Comparative Anatomy and Biology of Vertebrates (W)**  4
- **IBIO 341 Fundamental Genetics**  4
- **IBIO 355 Ecology**  3
- **IBIO 355L Ecology Laboratory (W)**  1
- **IBIO 369 Introduction to Zoo and Aquarium Science**  3
- **IBIO 445 Evolution (W)**  3
- **IBIO 489 Seminar in Zoo and Aquarium Science**  2
- **IBIO 498 Internship in Zoo and Aquarium Science**  4

(2) One of the following courses (3 or 4 credits):
- **ENT 404 Fundamentals of Entomology**  3
- **FW 471 Ichthyology**  4
- **IBIO 360 Biology of Birds**  4
- **IBIO 365 Biology of Mammals**  4
- **IBIO 384 Biology of Amphibians and Reptiles (W)**  4

(3) One of the following courses (3 or 4 credits):
- **ANS 313 Principles of Animal Feeding and Nutrition**  4
- **ANS 314 Genetic Improvement of Domestic Animals**  4
- **ANS 315 Anatomy and Physiology of Farm Animals**  4
- **FW 444 Conservation Biology**  3
- **FW 472 Limnology**  3
- **IBIO 353 Marine Biology (W)**  4

(4) Two of the following courses (6 to 8 credits):
- **ANS 405 Endocrinology of Reproduction**  4
- **ANS 455 Avian Physiology**  4
- **FW 424 Population Analysis and Management**  4
- **GEO 221 Introduction to Geographic Information and Laboratory**  3
- **GEO 221L Introduction to Geographic Information Laboratory**  1
- **GEO 324 Remote Sensing of the Environment**  4
- **IBIO 303 Oceanography**  4
- **IBIO 306 Invertebrate Biology**  4
- **IBIO 483 Environmental Physiology (W)**  4
- **IBIO 485 Tropical Biology (W)**  3
- **SOC 412 Animals, People and Nature**  3

Both Geography 221 and 221L must be completed to satisfy this requirement.
PART I – NEW ACADEMIC PROGRAMS AND PROGRAM CHANGES

(5) One additional course of at least 3 credits selected from a list of approved courses that is available from the Department of Integrative Biology.

(6) Integrative Biology courses that are not listed above must be approved in advance by the student’s academic advisor. Courses offered by other departments may be substituted if approved in advance by the student’s academic advisor.

Effective Fall 2016.

12. Change the administrative responsibility for the Master of Science degree in Zoology in the Department of Zoology to the Department of Integrative Biology. This department name change was effective July 1, 2016.

Effective Fall 2016.

13. Change the name of the Master of Science degree in Zoology to the Master of Science degree in Integrative Biology in the Department of Integrative Biology. The University Committee on Graduate Studies (UCGS) approved this request at its November 9, 2015 meeting.

Students admitted to the major prior to Fall 2016 will be awarded a Master of Science degree in Zoology.

Students admitted to the major Fall 2016 and forward will be awarded a Master of Science degree in Integrative Biology.

Effective Fall 2016.

14. Change the administrative responsibility for the Doctor of Philosophy degree in Zoology in the Department of Zoology to the Department of Integrative Biology. This department name change was effective July 1, 2016.

Effective Fall 2016.

15. Change the name of the Doctor of Philosophy degree in Zoology to the Doctor of Philosophy degree in Integrative Biology in the Department of Integrative Biology. The University Committee on Graduate Studies (UCGS) approved this request at its November 9, 2015 meeting.

Students admitted to the major prior to Fall 2016 will be awarded a Doctor of Philosophy degree in Zoology.

Students admitted to the major Fall 2016 and forward will be awarded a Doctor of Philosophy degree in Integrative Biology.

Effective Fall 2016.

16. Change the administrative responsibility for the Doctor of Philosophy degree in Zoology-Environmental Toxicology in the Department of Zoology to the Department of Integrative Biology. This department name change was effective July 1, 2016.

Effective Fall 2016.

17. Change the name of the Doctor of Philosophy degree in Zoology-Environmental Toxicology to the Doctor of Philosophy degree in Integrative Biology-Environmental Toxicology in the Department of Integrative Biology. The University Committee on Graduate Studies (UCGS) approved this request at its November 9, 2015 meeting.

Students admitted to the major prior to Fall 2016 will be awarded a Doctor of Philosophy degree in Zoology-Environmental Toxicology.

Students admitted to the major Fall 2016 and forward will be awarded a Doctor of Philosophy degree in Integrative Biology-Environmental Toxicology.

Effective Fall 2016.
COLLEGE OF SOCIAL SCIENCE

1. Change the requirements for the Minor in Anthropology in the Department of Anthropology.

   a. Under the heading Requirements for the Minor in Anthropology replace the entire entry with the following:

      Complete 18 credits in the Department of Anthropology from the following:
      1. Both of the following courses (6 credits):
         ANP 201 Introduction to Cultural Anthropology   3
         ANP 320 Social and Cultural Theory     3
      2. The following course (3 credits):
         ANP 206 Introduction to Physical Anthropology   3
      3. One of the following courses (3 credits):
         ANP 203 Introduction to Archaeology    3
         ANP 363 Rise of Civilization     3
      4. Complete 3 credits in an area course chosen from a list of approved courses available from the undergraduate advisor.
      5. Complete 3 credits in a topics course chosen from a list of approved courses available from the undergraduate advisor.

      Effective Summer 2016.

2. Change the requirements for the Bachelor of Arts degree in History. The Teacher Education Council (TEC) approved this request at its January 11, 2016 meeting.

   a. Under the heading Requirements for the Bachelor of Arts Degree in History make the following changes:

      (1) Replace item 1. with the following:

         The University’s Tier II writing requirement for the History major is met by completing one of the following courses: History 480, 481, 482, 483, 484, 485, 486, 487, 488, or 489. Those courses are referenced in item 3. below.

      (2) In item 3. b. delete the following courses:

         HST 205A The Ancient Mediterranean from 3000 BCE to 400 CE    4
         HST 205B Europe in the Middle Ages from 400 to 1500     4

         Add the following course:

         HST 205 The Ancient Mediterranean and the Medieval World    4

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

         HST 489 Seminar in Digital History (W)     3

      Effective Fall 2016.
3. Delete the curriculum and degree requirements for the Specialization in Spatial Information Processing in the Department of Geography. The University Committee on Undergraduate Education (UCUE) provided consultative commentary to the Provost after considering this request. The Provost made the determination to discontinue the program after considering the consultative commentary from the University Committee on Undergraduate Education.

No new students are to be admitted to the program effective Summer 2014. No students are to be readmitted to the program effective Summer 2014. Effective Fall 2015, coding for the program will be discontinued and the program will no longer be available in the Department of Geography. Students who have not met the requirements for the Specialization in Spatial Information Processing through the College of Social Science prior to Fall 2015 will have to change their major.

4. Change the Admission requirements for the Master of Human Resources and Labor Relations degree in Human Resources and Labor Relations in the School of Human Resources and Labor Relations. The University Committee on Graduate Studies (UCGS) approved this request at its January 11, 2016 meeting.

   a. Under the heading Admission replace the entire entry with the following:

   To be considered for admission to the master's degree program, a student must have a bachelor's degree and a cumulative grade–point average of 3.00 or higher in the junior and senior years. Applicants must have satisfactory scores on the Graduate Record Examination (GRE) General Test or on the Graduate Management Admission Test (GMAT). Applicants with five or more years of relevant work experience with successful professional records may be able to substitute that work experience for GRE or GMAT test scores. Applicants must complete one course in microeconomic principles, one course in statistics, and one course in behavioral sciences with a minimum grade of 3.0 in each course. In addition, applicants will be judged on the quality of their statement of objectives and three letters of reference.

   Effective Summer 2016.

5. Establish a Graduate Certificate in Program Evaluation in the Department of Psychology. The University Committee on Graduate Studies (UCGS) recommended approval of this request at its November 9, 2015 meeting.

   a. Background Information:

   The proposed Graduate Certificate in Program Evaluation, an online program, is a natural extension of the existent Master of Arts degree in Program Evaluation. The certificate targets students pursuing an advanced degree for whom the certificate would expand their skills and career options, as well as early-career evaluation professionals who desire formalized training but do not require a master’s degree. This online certificate program is comprised of 12 credits grounded in the core competencies for program evaluators. The program will provide training in evaluation theory, methods, and practice to prepare graduates to work as evaluators in a variety of settings, including government agencies, human service organizations, educational settings, healthcare organizations, and evaluation firms.

   The development of the program was precipitated by inquiries about the availability as an alternative to the master’s program in program evaluation. These are typically made by graduate students in other fields wishing to supplement their training with evaluation skills, as well as early to mid-career evaluators who do not have the time to devote to a master's degree program, but desire formal training.

   At Michigan State University, there are no similar certificate programs. There are however, four existing online certificate programs in the field of evaluation offered by U.S. institutions. These are offered by the University of Massachusetts-Boston, University of Wisconsin-Stout, University of Connecticut, and American University. A key strength distinguishing our certificate program is it provides students with a solid foundation in evaluation theory and design, while offering flexibility to individualize the program to meet one’s personal needs. The courses are taught by highly experienced and respected evaluation practitioners. Also, since the certificate is an extension of an existent master’s program, students have the advantage of being able to apply up to 9 credits from the certificate toward a master’s degree should they elect to pursue the advanced degree.
There are no accrediting agency or federal regulations related to the program. There are, however, national and international program evaluation standards and principles that all professional evaluators are expected to follow.

MSU is strongly positioned to offer an online graduate certificate in program evaluation. Its reputation of providing high quality education and being a leader in international education will extend the reach of this program to students abroad.

b. **Academic Programs Catalog Text:**

The Graduate Certificate in Program Evaluation prepares students for evaluation careers in diverse settings including government, education, social services, and evaluation consulting firms. It emphasizes professional development in history, theory, and standards of evaluation practice, evaluation methods, and evaluation practice skills.

**Admission**

To be admitted to the Graduate Certificate in Program Evaluation, applicants must have:

1. an academic record equivalent to at least 3.00 (B) in undergraduate course work in their junior and senior year. This requirement is waived for students currently pursuing a master’s or doctoral degree program at MSU.
2. submitted three letters of recommendation and a personal statement about their academic and professional goals and experience. This requirement is waived for students currently pursuing a master’s or doctoral degree program at MSU. Students currently pursuing a graduate degree at MSU should submit a letter from their program adviser or chairperson indicating that the student is in good standing and they agree the certificate is an appropriate adjunct training opportunity.

Admission to the program is selective and meeting the minimum standards does not guarantee admission. The applicant’s overall record is considered, including the student’s personal statement, recommendations, academic transcripts, and other documentation as required.

**Requirements for the Graduate Certificate in Program Evaluation**

The Graduate Certificate in Program Evaluation is available only online. A total of 12 credits are required for the certificate.

<table>
<thead>
<tr>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The following courses (3 credits):</td>
</tr>
<tr>
<td>PSY 880 Foundations of Evaluation Practice</td>
</tr>
<tr>
<td>2. One of the following courses (3 credits):</td>
</tr>
<tr>
<td>PSY 881 Evaluation Design</td>
</tr>
<tr>
<td>PSY 884 Qualitative and Mixed Method Evaluation Methods</td>
</tr>
<tr>
<td>3. Two of the following courses (6 credits):</td>
</tr>
<tr>
<td>PSY 881 Evaluation Design</td>
</tr>
<tr>
<td>PSY 882 Evaluation Data Collection Methods</td>
</tr>
<tr>
<td>PSY 883 Statistics for Evaluators I</td>
</tr>
<tr>
<td>PSY 884 Qualitative and Mixed Method Evaluation Methods</td>
</tr>
<tr>
<td>PSY 885 Communicating and Reporting</td>
</tr>
<tr>
<td>PSY 887 Statistics for Evaluators II</td>
</tr>
<tr>
<td>PSY 888 Evaluation Management</td>
</tr>
</tbody>
</table>

Courses used to fulfill requirement 1. above may not be used to fulfill this requirement.

Effective Fall 2016.
PART II - NEW COURSES

DEPARTMENT OF ADVERTISING AND PUBLIC RELATIONS

ADV 816 Fundraising and Philanthropy in Nonprofit Organizations
Spring of every year. 3(3-0) Interdepartmental with Communication. R: Open to graduate students in the College of Communication Arts and Sciences. Principles, function, practice, ethics, and process of fundraising and philanthropic development. Societal role of nonprofit organizations. Effective Spring 2016

DEPARTMENT OF ANIMAL SCIENCE

ANS 815 Advanced Topics in Reproduction and Development
Fall of every year. Spring of every year. 3(3-0) RB: Animal Science, Biology and Biomedical Sciences
Core concepts in animal reproduction and development. Recent advances relevant to animal and human fertility, development, and diseases. Effective Summer 2016

ANS 823 Grant Writing for Biomedical Research
Spring of every year. 2(2-0) RB: Minimum 2 years completed in a graduate (doctoral) program. R: Approval of department. Best practices for development, preparation and submission of competitive grant proposals for biomedical research. Effective Spring 2017

COLLEGE OF ARTS AND LETTERS

AL 375 Information Architecture
Fall of every year. 3(3-0) P: (AL 242) and completion of Tier I writing requirement R: Open to undergraduate students in the Experience Architecture Major or approval of college. Theory and practice for architecting information, including understanding and developing taxonomies, folkonomies, site structures, tagging systems, and guided navigation for user experience. Effective Spring 2016

DEPARTMENT OF BIOSYSTEMS AND AGRICULTURAL ENGINEERING

BE 849 Quantitative Human Health Risk Modeling and Analysis for Microbial Stressors
Fall of even years. 3(2-2) P: STT 421 or STT 464 or (STT 814 or concurrently) or approval of department RB: probability theory, mathematical modeling covered in the engineering and quantitative sciences. Background in toxicology, microbiology, food safety, and/or public health. Characterization of human health risk from exposures to environmental stressors. Development of empirical and statistical models for health effects and exposure analysis. Probabilistic risk characterization, uncertainty and sensitivity analysis. Problem-based critical evaluation of risk-based environmental decisions. Effective Spring 2016

BE 869 Life Cycle Assessment for Bioenergy and Bioproduct Systems
Spring of every year. 3(3-0) Interdepartmental with Chemical Engineering. R: Open to graduate students in the College of Engineering or in the Department of Biosystems and Agricultural Engineering or approval of department. Not open to students with credit in BE 469. Life cycle assessment to evaluate the environmental impacts of biological and chemical conversion processes. Biomass supply chain economics and technoeconomics for biomass conversion. Current policy considerations impacting the adoption of bioenergy and bioproduct systems. Effective Spring 2016
COLLEGE OF COMMUNICATION ARTS AND SCIENCES

CAS 116  Media Sketching and Graphics
Fall of every year. Spring of every year. 3(2-2) R: Open to undergraduate students in the
Department of Advertising and Public Relations or in the Department of Media and Information or in
the School of Journalism.
From sketching to final application in real and conceptual imagery using traditional and
digital methods.
Effective Fall 2016

CAS 117  Games and Interactivity
Fall of every year. Spring of every year. 3(2-2) R: Open to undergraduate students in the School of
Journalism and open to undergraduate students in the Department of Advertising and Public
Relations and open to undergraduate students in the Department of Media and Information.
Development of responsive media and iterative design from physical games to modern
interactive software.
Effective Fall 2016

DEPARTMENT OF COMPUTATIONAL MATHEMATICS, SCIENCE, AND ENGINEERING

CMSE 820  Mathematical Foundations of Data Science
Spring of every year. 3(3-0) RB: CMSE 802 or equivalent experience in programming and
numerical methods. Differential equations at the level of (MTH 235 or MTH 255H or (MTH 340 and
MTH 442) or (MTH 347H and MTH 442)). Linear algebra at the level of (MTH 309 or MTH 317H).
Probability and statistics at the level of STT 231.
Fundamental mathematical principles of data science that underlie the algorithms,
processes, and methods of data-centric thinking, and tools based on these principles.
Effective Fall 2016

CMSE 821  Numerical Methods for Differential Equations
Spring of every year. 3(3-0) RB: CMSE 802 or equivalent experience in programming and
numerical methods. Differential equations at the level of (MTH 235 or MTH 255H or (MTH 340 and
MTH 442) or (MTH 347H and MTH 442)). Linear algebra at the level of (MTH 309 or MTH 317H).
Numerical solution of ordinary and partial differential equations, including hyperbolic,
Effective Fall 2016

CMSE 822  Parallel Computing
Fall of every year. 3(3-0) Interdepartmental with Computer Science and Engineering. RB: Calculus
at the level of MTH 133. Ability to program proficiently in C/C++, basic understanding of data
structures and algorithms (both at the level of CSE 232). Basic linear algebra and differential
equations.
Core principles, techniques, and use of parallel computation using modern
supercomputers. Parallel architectures. Parallel programming models. Principles of
parallel algorithm design. Performance analysis and optimization.
Effective Fall 2016

CMSE 823  Numerical Linear Algebra
Fall of every year. 3(3-0) RB: (CMSE 802) or equivalent experience in programming and numerical
methods. Linear algebra at the level of MTH 309 or MTH 317H.
Methods in modern numerical linear algebra for solving linear systems, least squares
problems, and eigenvalue problems. Efficiency and stability of algorithms in numerical
linear algebra.
Effective Fall 2016

CMSE 890  Selected Topics in Computational Mathematics, Science, and Engineering
Fall of every year. Spring of every year. 1 to 4 credits. A student may earn a maximum of 12 credits
in all enrollments for this course. R: Approval of department.
Topics selected to supplement and enrich existing courses.
Effective Fall 2016
CMSE 891  Independent Study in Computational Mathematics, Science, and Engineering  
Fall of every year. Spring of every year. 1 to 4 credits. A student may earn a maximum of 6 credits in all enrollments for this course. R: Approval of department. Topics selected to supplement and enrich existing courses. Effective Fall 2016

CMSE 899  Master's Thesis Research  
Fall of every year. Spring of every year. Summer of every year. 1 to 6 credits. A student may earn a maximum of 8 credits in all enrollments for this course. R: Open to master's students in the Department of Computational Mathematics, Science, and Engineering. Master's thesis research. Effective Fall 2016

CMSE 999  Doctoral Dissertation Research  
Fall of every year. Spring of every year. Summer of every year. 1 to 24 credits. A student may earn a maximum of 36 credits in all enrollments for this course. R: Open to doctoral students in the Department of Computational Mathematics, Science, and Engineering. Doctoral dissertation research. Effective Fall 2016

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

CSE 482  Big Data Analysis  
Spring of every year. 3(3-0) P: CSE 331 and CSE 335 and STT 351 R: Open to juniors or seniors in the College of Engineering or in the Lyman Briggs Computer Science Coordinate Major or in the Lyman Briggs Computer Science Major. Data collection, storage, and preprocessing, and analysis techniques. Programming for large-scale data analysis. Case studies and applications. Effective Spring 2017

DEPARTMENT OF ENTOMOLOGY

ENT 461  Field Ecology of Disease Vectors  
Summer of every year. 3(1-4) Interdepartmental with Fisheries and Wildlife. RB: (ENT 460 or FW 463) or Courses in Epidemiology or Public Health. R: Not open to freshmen. Collection and identification of arthropod vectors of human and animal diseases in Michigan. Assays for associated pathogens. Integration of disease ecology and public health responses to vector-borne disease. Effective Summer 2016

DEPARTMENT OF FISHERIES AND WILDLIFE

FW 449  Wildlife Policy  
Spring of odd years. 3(2-2) RB: IBIO 355 and FW 364 R: Not open to freshmen or sophomores or approval of department. Controversial issues in wildlife policy. Science and political analysis drawing on ecology, economics, sociology. Argument analysis. Effective Fall 2015

FW 449L  Wildlife Policy – Study Away  
Spring of odd years. 1(0-3) P: FW 449 or concurrently or approval of department; application required R: Not open to freshmen or sophomores. Onsite examination of controversial issues of in wildlife policy. Field trip required. Effective Fall 2015

FW 876  Advanced Fish Ecology  
Fall of odd years. 3(2-2) RB: (IBIO 355, FW 471 and FW 479) or Ecology, Biology of Fish (Ichthyology), and Fish Management R: Open to graduate students or approval of department. Advanced ecology of fishes in freshwater and marine ecosystems. Effective Fall 2015
PART II – NEW COURSES

DEPARTMENT OF GEOGRAPHY

GEO 201  Introduction to Plant Geography
Fall of even years. 3(3-0) R: Not open to graduate students.
Geographic distribution and characteristics of plants throughout the world; relationships between biomes and aspects of the physical environment (climate, soils, landforms, disturbance); plant ecology; human impacts on vegetation; optional field trip on campus.
Effective Spring 2016

GEO 415  Location Theory and Land Use Analysis
Fall of even years. 3(3-0) Interdepartmental with Urban Planning. P: GEO 113 or UP 201 RB: EC 201 or EC 202 R: Not open to freshmen or sophomores.
REINSTatement  Classical and neoclassical, static and dynamic models of industrial location and spatial organization. Land rent theory. Central place theory. Multi-locational organization. Growth transmission.
Effective Fall 2016

GEO 837  Remote Sensing of the Biosphere
Fall of even years. 3(3-0) P: GEO 424 or approval of department
Remote sensing for environmental and global change research. Advanced image interpretation and applications with emphasis on independent research projects.
Effective Fall 2016

DEPARTMENT OF GEOLOGICAL SCIENCES

GLG 435  Geomicrobiology
Fall of every year. 4(3-2) Interdepartmental with Microbiology and Molecular Genetics. RB: GLG 201 or MMG 201 or BS 161 or LB 145 R: Open to juniors or seniors or graduate students in the College of Natural Science or in the Lyman Briggs College.
Geological and microbiological perspectives on microbial activities in diverse environmental settings, including geological change mediated by microorganisms, microbial evolution driven by geologically diverse habitats, including the evolution of life on Earth, the search for life on other planets, the study of life in extreme environments, and industrial applications of geomicrobiology.
Effective Fall 2016

GLG 493  Field Studies in Geological Sciences
On Demand. 1 to 6 credits. A student may earn a maximum of 8 credits in all enrollments for this course. P: GLG 201 and GLG 304 RB: Specific programs may have additional prerequisites. R: Open to juniors or seniors or graduate students in the Department of Geological Sciences or in the Lyman Briggs Environmental Geosciences Coordinate Major or in the Lyman Briggs Geological Sciences Coordinate Major. Approval of department.
Field experiences in solid earth and environmental geosciences within the US and abroad. Field trips required.
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 Summer 2016

GLG 498  Topics in Geological Sciences
On Demand. 1 to 4 credits. A student may earn a maximum of 8 credits in all enrollments for this course. P: GLG 201 and GLG 304 or approval of department R: Open to juniors or seniors or graduate students in the Department of Geological Sciences or in the Lyman Briggs Environmental Geosciences Coordinate Major or in the Lyman Briggs Geological Sciences Coordinate Major. Selected topics in geological and geoenvironmental sciences supplementing or expanding specific topics, or examining topics not covered in regular courses.
Effective Spring 2016

GLG 813  Hillslope Hydrology
Spring of every year. 4(3-1)
Advanced course on Hillslope Hydrology covering the physical, chemical, and isotopic characteristics of river runoff generation from the pore to the catchment scale.
Effective Spring 2017
GLG 889  Special Problems in Geocognition  
Fall of every year. Spring of every year. Summer of every year. 1 to 4 credits. A student may earn a maximum of 9 credits in all enrollments for this course.  
Individual study on current problems in geocognition and geoscience education research  
Effective Summer 2016  

DEPARTMENT OF HISTORY  

HST 205  The Ancient Mediterranean and the Medieval World  
Fall of every year. 4(4-0)  
SA: HST 205A, HST 205B  
Effective Fall 2016  

HST 332  Medieval Europe  
Spring of every year. 3(3-0)  
SA: HST 332A, HST 332B, HST 333  
Effective Spring 2017  

HST 475  History of the Book: From Manuscripts to Comics  
Fall of even years. 3(3-0) Interdepartmental with English. R: Not open to freshmen.  
History of the book from medieval manuscripts to modern forms. Publishing, illustration, censorship, manuscript and print culture.  
Effective Fall 2016  

JAMES MADISON COLLEGE  

MC 333  Performance, Politics, and Nation  
Spring of every year. 4(3-0) A student may earn a maximum of 8 credits in all enrollments for this course. P: MC 230 or MC 231 or MC 280 or MC 281 or approval of college R: Open to undergraduate students in the James Madison College or approval of college.  
Analysis of theories of and approaches to political performances and constructions of cultural nationalism, which includes social construction theory, the sociology of performance, ethnography, ethnomusicology and folklore, and critical approaches to nationalism, from classic studies to issues in gender, race, and post-colonialism.  
Effective Fall 2016  

MC 334  Rights, Advocacy, and Activism  
Fall of odd years. 4(3-0) P: MC 230 and MC 231 or approval of college R: Open to undergraduate students in the James Madison College.  
Global perspectives on human rights, non-governmental organization (NGO) advocacy, and grassroots activism as mechanisms of change. Case studies on racial and cultural discrimination, gender-based violence, sexuality and rights, environment and climate justice, refugees and immigration, and other topics.  
Effective Fall 2016
DEPARTMENT OF LARGE ANIMAL CLINICAL SCIENCES

LCS 569  Sport Horse Evaluation, Rehabilitation and Therapy
Spring of every year. 1(1-0) RB: Completion of year 1 of the graduate professional program in the College of Veterinary Medicine. R: Open to graduate-professional students in the College of Veterinary Medicine.
Hands-on diagnostic evaluation and treatment of the equine athlete. Traditional medical approaches, acupuncture, and chiropractic manipulation.
Effective Spring 2016

MSU COLLEGE OF LAW

LAW 549F  Comparative Free Expression
Spring of every year. 0 to 6 credits. P: (LAW 500C) and LAW 530J and (LAW 530D or LAW 530E or LAW 530Q or LAW 530N) R: Open to Law students or master of laws students or law lifelong students or law non-degree students. Not open to students with credit in LAW 549D.
Examination of approaches to free expression in a variety of different countries.
Effective Spring 2016

DEPARTMENT OF LINGUISTICS AND GERMANIC, SLAVIC, ASIAN AND AFRICAN LANGUAGES

RUS 250  Russian and Soviet Cinema
Spring of every year. 3(3-2)
Development of Russian and Soviet cinematic styles and traditions in their historical and social contexts. Major films and directors. Introduction to film technique and analysis.
Taught in English.
Effective Fall 2016

DEPARTMENT OF MARKETING

MKT 891  Special Topics in Marketing
Fall of every year. Spring of every year. 1 to 6 credits. A student may earn a maximum of 6 credits in all enrollments for this course. R: Open to graduate students in the Marketing Research major or approval of department.
Special topics in marketing.
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 2016

PROGRAM IN NEUROSCIENCE

NEU 417  Instrumental Methods of Analysis in Neuroscience
Spring of every year. 3(3-0) Interdepartmental with Chemistry. P: (((CEM 251 and CEM 252) or (CEM 351 and CEM 352)) and (PHY 231 and PHY 232)) or (PHY 183 and PHY 184) or (PHY 193H and PHY 294H) or (LB 273 and LB 274) RB: NEU 301 or CEM 262
Design, operational principles and practical application of modern instrumental methods used for the separation, identification and quantification of neurochemical species in neuroscience. Application of methods of chemical analysis to study neurosignaling, chemical composition in single secretory cells, chemical structure of cells and tissues.
Effective Spring 2016

NEU 425  Computational Modeling in Neuroscience
Spring of every year. 3(3-0) P: NEU 302 RB: (MTH 124 and MTH 126) or (MTH 132 and MTH 133) R: Open to undergraduate students in the Neuroscience Major or in the Lyman Briggs Neuroscience Major.
Introduction to theory and network modeling techniques in neuroscience, using brain activity data to validate theoretical models. Review of successful network models.
Effective Spring 2016
PART II – NEW COURSES

NEU 435  Ion Channels of Excitable Membranes
Fall of every year. 3(3-0) Interdepartmental with Integrative Biology. P: (NEU 302 and NEU 311L) or IBIO 402 RB: (PHM 350 or PSL 431) and IBIO 341 R: Open to undergraduate students in the Neuroscience Major or in the Bachelor of Science in Zoology or in the Lyman Briggs Neuroscience Major or in the Lyman Briggs Zoology Coordinate Major.
Introduction to ion channels and their critical role in normal physiological functioning, sensory and neuromuscular diseases and disorders, as well as targets of toxins and poisons.
Effective Fall 2016

NEU 440  Synaptic Transmission
Spring of even years. 3(3-0) P: NEU 301 R: Open to undergraduate students in the Neuroscience Major or in the Lyman Briggs Neuroscience Major.
Chemical and electrical aspects of nerve impulse transmission at synaptic and neuroeffector junctions. Influence of drugs.
Effective Spring 2016

NEU 445  Analysis of Neural Activity Data (W)
Fall of every year. 3(3-0) P: ((NEU 301 and (NEU 302 or concurrently)) and completion of Tier I writing requirement) and (MTH 124 or MTH 132 or MTH 152H or LB 118) and (STT 201 or STT 231 or STT 421 or PSY 295)
Conceptual and practical approaches to analyzing large functional datasets. Emphasis on statistical issues, including preprocessing, estimation methods, hypothesis testing, dimension reduction, and correlation with behavior. Data types include electrophysiological recording, electroencephalography (EEG), magnetoencephalography (MEG), functional Magnetic Resonance Imaging (fMRI) and optical imaging.
Effective Fall 2015

DEPARTMENT OF PHARMACOLOGY AND TOXICOLOGY

PHM 461  Tropical Medicine Pharmacology
Fall of every year. Summer of every year. 2(2-0) P: PHM 350 or concurrently R: Open to juniors or seniors or master's students. Approval of department.
Tropical diseases, epidemiologic and clinical features, and pharmacologic treatments. Multidisciplinary and interdisciplinary approaches, especially in poverty settings.
Effective Fall 2016

COLLEGE OF SOCIAL SCIENCE

SSC 494  Undergraduate Research in Social Science
Fall of every year. Spring of every year. Summer of every year. 1 to 6 credits. A student may earn a maximum of 8 credits in all enrollments for this course. RB: Methods course completed for major R: Open to undergraduate students in the College of Social Science or approval of college; application required.
Faculty-guided undergraduate research in the social sciences
Effective Summer 2016

DEPARTMENT OF STATISTICS AND PROBABILITY

STT 805  Statistical Modeling for Business Analytics
Summer of every year. 3(3-0) RB: STT 442 R: Open to master's students in the Business Analytics Major.
Effective Summer 2016
DEPARTMENT OF SUPPLY CHAIN MANAGEMENT

SCM 304  Survey of Supply Chain Management  
Fall of every year. Spring of every year. Summer of every year. 3(3-0) R: Not open to students in the Eli Broad College of Business and The Eli Broad Graduate School of Management.  
Objectives, processes, and functions of supply chain management activities including procurement, manufacturing, and logistics. The role of supply chain processes in creating competitive advantage with respect to quality, flexibility, lead-time, and cost.  
Effective Fall 2016

DEPARTMENT OF TEACHER EDUCATION

TE 910  Youth Language and Literacy in Schools and Communities  
Fall of even years. 3(3-0) RB: Courses or work experiences in education, youth or adolescent development and programming, literacy, urban studies, ethnic studies, sociolinguistics  
Contemporary research, theory, and practice critically situate school and beyond school language and literacy learning in the lives of youth and their communities. Focus on social justice-oriented work with youth of color and other young people marginalized by systemic inequalities. Increasing understanding of the oral and written communication through many young people engage in through their participation in youth cultures. A study of race, class, gender identity, sexuality, ability, and citizenship status as they are lived through languages and literacies by youth and their communities.  
Effective Fall 2016

DEPARTMENT OF THEATRE

THR 100  Introduction to Theatre  
Fall of every year. Spring of every year. Summer of every year. 3(3-0)  
Introduction to the technique, vocabulary and appreciation of theatre in its varied forms within historical and contemporary contexts.  
Effective Summer 2017

THR 208  Innovation through Improvisation  
Fall of every year. Spring of every year. 2(0-4) RB: THR 101  
Exploration of principles and processes of improvisation as they pertain to entrepreneurship and career development. Critical skills in communication, critical thinking and leadership.  
Effective Fall 2016

COLLEGE OF VETERINARY MEDICINE

VM 834  Current Issues in Food Safety  
Summer of every year. 1 to 6 credits. A student may earn a maximum of 6 credits in all enrollments for this course. R: Open to graduate students in the College of Veterinary Medicine or in the Food Safety Major or approval of department.  
Current issues in food safety including: allergen control in the manufacturing setting, microbial control in the manufacturing setting, good manufacturing practices, ingredient safety, preventative control, produce food safety. Other topics as needed.  
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
PART III – COURSE CHANGES

DEPARTMENT OF ACCOUNTING AND INFORMATION SYSTEMS

ITM 311  Systems Analysis and Design
Fall of every year. Spring of every year. 3(3-0) R: Open to juniors or seniors in the Eli Broad College of Business and The Eli Broad Graduate School of Management or in the Information Technology Specialization and not open to students in the School of Hospitality Business. R: Open to juniors or seniors in the Eli Broad College of Business and The Eli Broad Graduate School of Management or in the Information Technology Minor and not open to students in the School of Hospitality Business.
- Structured analysis and design of information systems. Understanding of the system development process, and organizational issues associated with the design and implementation of information systems.
  Effective Spring 2013 Effective Fall 2016

ITM 444  Information Technology Project Management
Spring of every year. 3(3-0) Interdepartmental with Computer Science and Engineering and Telecommunication. Interdepartmental with Computer Science and Engineering and Media and Information P: ITM 311 R: Open to students in the Information Technology Specialization. R: Open to students in the Information Technology Minor.
- Practical training and experiences in design, testing, and launch of new information technologies and systems.
  Effective Spring 2013 Effective Fall 2016

DEPARTMENT OF ADVERTISING AND PUBLIC RELATIONS

ADV 893  Internship Practicum
Fall of every year. Spring of every year. Summer of every year. 1 to 3 credits. A student may earn a maximum of 3 credits in all enrollments for this course. R: Open to graduate students in the Department of Advertising, Public Relations and Retailing. Approval of department. R: Open to graduate students in the Department of Advertising and Public Relations or approval of department.
- Supervised experience in advertising and/or public relations settings.
  Request the use of the Pass-No Grade (P-N) system.
  Effective Fall 2014 Effective Spring 2016

DEPARTMENT OF ANIMAL SCIENCE

ANS 805  Animal Welfare Assessment
Fall of every year. 3(3-0) Interdepartmental with Zoology. Interdepartmental with Integrative Biology RB: (ANS 305 or ZOL 313) or background in animal science or zoology including exposure to topics such as animal behavior, physiology, management, and husbandry. RB: (ANS 305 or IBIO 313) or background in animal science or zoology including exposure to topics such as animal behavior, physiology, management, and husbandry.
- Multidisciplinary online computer-based instruction in animal welfare science and related issues including physiology, behavior, human-animal interactions, suffering and pain, ethics, health, assessment and standards, and economics.
  Effective Fall 2013 Effective Fall 2016

DEPARTMENT OF ART, ART HISTORY, AND DESIGN

STA 111  Drawing II
Fall of every year. Spring of every year. 3(0-6) P: STA 110
- Development of imagery and expression; abstraction and the use of the human figure as subject matter.
  DELETE COURSE
  Effective Summer 2016
**BIOLOGICAL SCIENCE PROGRAM**

**BS 162**  
Organismal and Population Biology  
Fall of every year. Spring of every year. Summer of every year. 3(3-0) **Interdepartmental with Plant Biology and Zoology, Interdepartmental with Integrative Biology and Plant Biology**. P: BS 161 or BS 181H or LB 145. Not open to students with credit in BS 182H or LB 144.

SA: BS 110, BS 148H  
**Effective Fall 2013**  
**Effective Fall 2016**

**BS 172**  
Organismal and Population Biology Laboratory  
Fall of every year. Spring of every year. Summer of every year. 2(1-3) **Interdepartmental with Plant Biology and Zoology, Interdepartmental with Integrative Biology and Plant Biology**. P: (BS 162 or concurrently) or (BS 182H or concurrently). Not open to students with credit in BS 192H or LB 144.

Nature and process of organismal biology including experimental design, statistical methods, hypothesis testing in genetics, ecology, and evolution.  
SA: BS 110, BS 158H  
**Effective Fall 2013**  
**Effective Fall 2016**

**BS 182H**  
Honors Organismal and Population Biology  
Fall of every year. 3(3-0) **Interdepartmental with Lyman Briggs and Plant Biology and Zoology, Interdepartmental with Integrative Biology and Lyman Briggs and Plant Biology**. Not open to students with credit in BS 162 or LB 144.

Diversity and basic properties of organisms, with emphasis on genetic principles, ecological interactions, and the evolutionary process. Historical approach to knowledge discovery.  
SA: BS 148H, BS 110  
**Effective Fall 2013**  
**Effective Fall 2016**

**BS 192H**  
Honors Organismal and Population Biology Laboratory  
Fall of every year. 2(1-3) **Interdepartmental with Lyman Briggs and Plant Biology and Zoology, Interdepartmental with Integrative Biology and Lyman Briggs and Plant Biology**. P: BS 182H or concurrently. Not open to students with credit in BS 172 or LB 144.

Nature and process of organismal biology, including experimental design and statistical methods, hypothesis testing, genetics, ecology, and evolution.  
SA: BS 158H, BS 110  
**Effective Fall 2013**  
**Effective Fall 2016**

**DEPARTMENT OF BIOSYSTEMS AND AGRICULTURAL ENGINEERING**

**BE 482**  
Diffuse-Source Pollution Engineering  
Spring of every year. 3(2-2) P: (BE 350 or CE 483) and (BE 360 or CE 487). P: (BE 350 or ENF 483) and (BE 360 or ENF 487). R: Open to juniors or seniors in the College of Engineering.

Identification, estimation, and control of diffuse source pollution from agricultural and urban sources. Analysis of diffuse source pollutants in biological systems. Engineering design of practices and structures to prevent, mitigate, and treat diffuse source pollution, including low impact development (LID) strategies.  
**Effective Fall 2013**  
**Effective Spring 2016**
THE ELI BROAD COLLEGE OF BUSINESS

PIM 800 Managerial Skills
Summer of every year. 2(2-0) 1 to 3 credits. R: Open only to MBA students in the Program in Integrative Management. R: Open to MBA students in the Eli Broad College of Business and The Eli Broad Graduate School of Management or in the Master of Business Administration in Integrative Management.
Approaches to effective group management in business organizations. Creating, maintaining, and leading work groups. Development of skills necessary to manage individuals, groups, and the organizational context.
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 Summer 2005 Effective Fall 2016

PIM 801 Organizational Analysis
Fall of every year. 4 to 2 credits. 1 to 3 credits. R: Open to students in the Master of Business Administration in Integrative Management. R: Open to MBA students in the The Eli Broad College of Business or in the Master of Business Administration in Integrative Management.
Faculty supervised analysis of the student’s employing organization. Organization and financial structure, information, accounting, operating, and marketing systems. Faculty supervised analysis of the student’s employing organization from a broad organizational behavior perspective.
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 1 semester after the end of the semester of enrollment.
Effective Fall 2011 Effective Fall 2016

PIM 802 Integrative Case Competition
Spring of every year. 1 to 2 credits. 1 to 3 credits. R: Open to students in the Master of Business Administration in Integrative Management. R: Open to MBA students in the Eli Broad College of Business and The Eli Broad Graduate School of Management or in the Master of Business Administration in Integrative Management.
Development of and participation in a significant case study integrating strategy, marketing, finance, human resource, and other business management issues.
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 Summer 2010 Effective Fall 2016

PIM 803 Leadership Development
Fall of every year. Spring of every year. 4 to 2 credits. 1 to 3 credits. R: Open to students in the Master of Business Administration in Integrative Management. R: Open to MBA students in the Eli Broad College of Business and The Eli Broad Graduate School of Management or in the Master of Business Administration in Integrative Management.
Assessment and analysis of individual characteristics associated with effective leadership. Identifying personal strengths that are important for developing one’s leadership potential. Planning for further capitalization on these strengths.
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 1 semester after the end of the semester of enrollment.
Effective Summer 2011 Effective Fall 2016
PART III – COURSE CHANGES

PIM 804 Strategic Vision
Spring of every year. **Summer of every year, 1 to 2 credits, 1 to 3 credits. R:** Open to students in the Master of Business Administration in Integrative Management. **R:** Open to MBA students in the Eli Broad College of Business and The Eli Broad Graduate School of Management or in the Master of Business Administration in Integrative Management.

Supervised analysis of the student's employing organization, including interviewing the CEO or visible leader. Supervised analysis of the student's employing organization, including interviewing the CEO or senior leader with strategy formulation responsibilities. 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 1 semester after the end of the semester of enrollment. 

*Effective Summer 2011 Effective Fall 2016*

PIM 811 Financial Accounting Concepts
Summer of every year. **2(2-0) 1 to 3 credits. R:** Open only to MBA students in the Program in Integrative Management. **R:** Open to MBA students in the Eli Broad College of Business and The Eli Broad Graduate School of Management or in the Master of Business Administration in Integrative Management.

Financial reporting issues from a user's perspective. Measurement, valuation, and reporting concepts and issues. Analysis and use of financial accounting information for decision making. Financial reporting issues from a user's perspective. Measurement and reporting concepts and issues. Analysis and use of financial accounting information for decision making. 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 Summer 1995 Effective Fall 2016*

PIM 812 Managerial Accounting
Fall of every year. **1.5(1.5-0) 1 to 3 credits. RB: PIM 811 R:** Open only to MBA students in the Program in Integrative Management. **R:** Open to MBA students in the Eli Broad College of Business and The Eli Broad Graduate School of Management or in the Master of Business Administration in Integrative Management.

Accounting information for decision making and control: cost behavior patterns, activity-based costing, cost allocations, budgeting, transfer pricing, and accounting controls. Application of course concepts to work environment. The objective of this course is to provide essential tools and skills to enable you to make business decisions using accounting information. This course focuses on the preparation and use of accounting information for planning and control purposes.

*Effective Summer 2005 Effective Fall 2016*

PIM 813 Information Systems
Fall of every year. **1.5(1.5-0) 1 to 3 credits. R:** Open only to MBA students in the Program in Integrative Management. **R:** Open to MBA students in the Eli Broad College of Business and The Eli Broad Graduate School of Management or in the Master of Business Administration in Integrative Management.


*Effective Summer 1995 Effective Fall 2016*
PART III – COURSE CHANGES

PIM 814  
Financial Statement Analysis and Corporate Governance  
Financial Statement Analysis  
Summer of every year. 1.5(1.5-0) 1 to 3 credits. R: Open to students in the Master of Business Administration in Integrative Management. R: Open to MBA students in the Eli Broad College of Business and The Eli Broad Graduate School of Management or in the Master of Business Administration in Integrative Management.  
Effective Summer 2010  Effective Fall 2016

PIM 821  
Managerial Economics  
Fall of every year. Summer of every year. 1.5 to 2 credits. 1 to 3 credits. R: Open only to MBA students in the Program in Integrative Management. R: Open to MBA students in the Eli Broad College of Business and The Eli Broad Graduate School of Management or in the Master of Business Administration in Integrative Management.  
Economics of the firm, with applications. Supply and demand, production and cost, competitive markets, pricing with market power, strategic behavior. Economics of the firm, with applications. Demand, production and cost, pricing and strategic behavior.  
Effective Summer 2005  Effective Fall 2016

PIM 822  
Macroeconomics for Managers  
Fall of every year. Summer of every year. 1.5(1.5-0) 1 to 3 credits R: Open only to MBA students in the Program in Integrative Management. R: Open to MBA students in the Eli Broad College of Business and The Eli Broad Graduate School of Management or in the Master of Business Administration in Integrative Management.  
Effective Fall 1998  Effective Fall 2016

PIM 831  
Legal Environment of Business  
Spring of every year. 1.5(1.5-0) 1 to 3 credits. R: Open only to MBA students in the Program in Integrative Management. R: Open to MBA students in the Eli Broad College of Business and The Eli Broad Graduate School of Management or in the Master of Business Administration in Integrative Management.  
The U.S. legal system. Interrelationship of law and ethics. Regulation of business by courts, state and federal statutes, and governments. Applications of course concepts to work environment.  
Effective Summer 2005  Effective Fall 2016

PIM 841  
Corporate Finance  
Fall of every year. Spring of every year. 1.5(1.5-0) 1 to 3 credits. RB: PIM 811 R: Open only to MBA students in the Program in Integrative Management. R: Open to MBA students in the Eli Broad College of Business and The Eli Broad Graduate School of Management or in the Master of Business Administration in Integrative Management.  
Effective Summer 1995  Effective Fall 2016

PIM 842  
Managerial Finance  
Spring of every year. 1.5(1.5-0) 1 to 3 credits. RB: PIM 811 and PIM 841 R: Open only to MBA students in the Program in Integrative Management. R: Open to MBA students in the Eli Broad College of Business and The Eli Broad Graduate School of Management or in the Master of Business Administration in Integrative Management.  
Market efficiency, capital budgeting, security issues, dividend policy, capital structure, and bankruptcy costs. Agency problems between different stakeholders and option pricing. Application of course concepts to work environment.  
Effective Summer 1995  Effective Fall 2016
PIM 850  Analysis and Decision Modeling  
Fall of every year.  Summer of every year.  2(1.8-0.4) 1 to 3 credits.  RB: STT 315  R: Open only to MBA students in the Program in Integrative Management.  R: Open only to MBA students in the Eli Broad College of Business and The Eli Broad Graduate School of Management or in the Master of Business Administration in Integrative Management.  
Models to support decision making: applications of regression analysis, decision analysis, simulation, forecasting, and project management. Models to support decision making: applications of regression analysis, decision analysis, and forecasting.  
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 Summer 2005  Effective Fall 2016

PIM 852  Negotiation  
Fall of every year. Spring of every year.  1.5(1.5-0) 1 to 3 credits.  R: Open to students in the Master of Business Administration in Integrative Management.  R: Open to MBA students in the Eli Broad College of Business and The Eli Broad Graduate School of Management or in the Master of Business Administration in Integrative Management.  
Dynamics of negotiation and conflict resolution using negotiation to manage people and interpersonal relations. Developmental processes, stages, and types of conflict. Conflict management and resolution. Negotiation strategies and planning steps, analysis of leverage, tactics for creating and claiming value, and strategies for resolving conflicts.  Addresses the complexities of adding multiple parties, using agents, and involving third parties in negotiation and conflict resolution.  
Effective Spring 2008  Effective Fall 2016

PIM 853  Human Resource Management  
Fall of every year. Spring of every year.  1.5(1.5-0) 1 to 3 credits.  R: Open only to MBA students in the Program in Integrative Management.  R: Open to MBA students in the Eli Broad College of Business and The Eli Broad Graduate School of Management or in the Master of Business Administration in Integrative Management.  
Strategic organizational issues associated with managing the labor market to acquire, develop, and compensate human resources. Application of course concepts to work environment. This course addresses how organizations and managers can effectively attract, select, motivate, retain, develop, and otherwise optimally utilize their human resources.  
Effective Fall 1998  Effective Fall 2016

PIM 855  Strategic Management  
Fall of every year.  3(3-0) 1 to 3 credits.  R: Open only to MBA students in the Program in Integrative Management.  R: Open to MBA students in the Eli Broad College of Business and The Eli Broad Graduate School of Management or in the Master of Business Administration in Integrative Management.  
Effective Fall 1998  Effective Fall 2016

PIM 862  Customer and Competitor Analysis  
Spring of every year.  1.5(1.5-0) 1 to 3 credits.  RB: PIM 861  R: Open only to MBA students in the Program in Integrative Management.  R: Open to MBA students in the Eli Broad College of Business and The Eli Broad Graduate School of Management or in the Master of Business Administration in Integrative Management.  
Assessment of consumer and organizational buying behavior processes and competitive environments. Competitive strategies and customers' needs, wants, motivations, and behaviors throughout the value-added chain. Application of course concepts to work environment.  
Effective Summer 1995  Effective Fall 2016
PART III – COURSE CHANGES

PIM 863  Marketing Systems
Fall of every year. Spring of every year. 1.5(1.5-0) 1 to 3 credits. R: Open only to MBA students in the Program in Integrative Management. R: Open to MBA students in the Eli Broad College of Business and The Eli Broad Graduate School of Management or in the Master of Business Administration in Integrative Management.
Marketing decision making within global, customer, economic, ecological, and competitive environments. Gathering and analyzing marketing information. Developing strategies to guide the organization and operational market plans. Application of course concepts to work environment.
Effective Fall 1998 Effective Fall 2016

PIM 870  Supply Chain Management
Fall of every year. Summer of every year. 1.5(1.5-0) 1 to 3 credits. R: Open only to MBA students in the Program in Integrative Management. R: Open to MBA students in the Eli Broad College of Business and The Eli Broad Graduate School of Management or in the Master of Business Administration in Integrative Management.
Development of strategies within the supply chain. Interrelationships among purchasing, manufacturing, operations, and logistics management to enhance economic competitiveness. Application of course concepts to work environment. Understanding supply chain management and its impact on competitive advantage. Introduction of logistics, operations management, and procurement and cross-functional integration in supply chains.
Effective Fall 1998 Effective Fall 2016

PIM 871  Innovation of Products and Services
Fall of every year. Summer of every year. 1.5(1.5-0) 1 to 3 credits. R: Open to students in the Master of Business Administration in Integrative Management. R: Open to MBA students in the Eli Broad College of Business and The Eli Broad Graduate School of Management or in the Master of Business Administration in Integrative Management.
Analytic, decision-making, and planning concepts and tools for development of new innovative products and services. Strategic management of technological innovation within changing market environments. 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 Summer 2008 Effective Fall 2016

PIM 872  International Strategies
Summer of every year. 1.5(1.5-0) 1 to 3 credits. R: Open to students in the Master of Business Administration in Integrative Management. R: Open to MBA students in the Eli Broad College of Business and The Eli Broad Graduate School of Management or in the Master of Business Administration in Integrative Management.
Effective Summer 2008 Effective Fall 2016

PIM 873A  Current Business Issues: Finance
Fall of every year. Spring of every year. Summer of every year. 1.5 to 3 credits. 1 to 3 credits. A student may earn a maximum of 9 credits in all enrollments for this course. R: Open only to MBA students in the Program in Integrative Management. R: Open to MBA students in the Eli Broad College of Business and The Eli Broad Graduate School of Management or in the Master of Business Administration in Integrative Management.
Perspectives on current and emerging topics.
Effective Fall 2003 Effective Fall 2016
PIM 873F  Current Business Issues: Management
Fall of every year. Spring of every year. Summer of every year. 1.5 to 3 credits, 1 to 3 credits. A student may earn a maximum of 9 credits in all enrollments for this course. R: Open only to MBA students in the Program in Integrative Management. R: Open to MBA students in the Eli Broad College of Business and The Eli Broad Graduate School of Management or in the Master of Business Administration in Integrative Management. A student may earn a maximum of 9 credits on current and emerging topics. Individual, team, and process factors that affect the effectiveness of strategic decisions.
Effective Fall 2002 Effective Fall 2016

PIM 874  The Global Marketplace
Summer of every year. 2(2-0) 1 to 3 credits. R: Open only to MBA students in the Program in Integrative Management. R: Open to MBA students in the Eli Broad College of Business and The Eli Broad Graduate School of Management or in the Master of Business Administration in Integrative Management.
Commercial, economic, cultural, and political aspects of global environments. Exposure to leading executives and government representatives of major trading partners. Develop a comparative framework for competitive strategy in a multi-country context. Field Trip required. Commercial, economic, cultural, and political aspects of global environments. Exposure to leading executives and government representatives of international corporations, organizations and countries. Develop a comparative framework for competitive strategy in a multi-country context and a deeper understanding of cultural nuances through classroom and international/offsite experiences with global organizations.
Effective Fall 1998 Effective Fall 2016

PIM 875  Supply Chain Management II
Fall of every year. Spring of every year. Summer of every year. 1.5(1.5-0) 1 to 3 credits. R: Open to students in the Master of Business Administration in Integrative Management. R: Open to MBA students in the Eli Broad College of Business and The Eli Broad Graduate School of Management or in the Master of Business Administration in Integrative Management.
Advanced supply chain management strategies and applications. Integration of purchasing, manufacturing, operations and logistics in a global market. Discussion of advanced supply chain management strategies and global applications with emphasis on supply chain process improvement techniques, quality management and strategic sourcing.
Effective Summer 2008 Effective Fall 2016

PIM 876  Ethics in the Workplace
Fall of every year. Spring of every year. 1.5(1.5-0) 1 to 3 credits. A student may earn a maximum of 2 credits in all enrollments for this course. R: Open only to Weekend MBA students. R: Open to MBA students in the Eli Broad College of Business and The Eli Broad Graduate School of Management or in the Master of Business Administration in Integrative Management.
Ethical dimensions of decision making in the business environment. Ethical awareness and sound judgment are essential for individual success and organizational effectiveness. In this course, we examine the ethical aspects of individual and corporate decision-making and provide practical resources for making ethical decisions within the business context.
Effective Summer 2005 Effective Fall 2016

PIM 891  Special Topics in Business
Fall of every year. Spring of every year. Summer of every year. 1.5 to 3 credits, 1 to 3 credits. A student may earn a maximum of 9 credits in all enrollments for this course. R: Open only to Weekend MBA students. R: Open to MBA students in the Eli Broad College of Business and The Eli Broad Graduate School of Management or in the Master of Business Administration in Integrative Management.
Faculty-supervised study in special topics relevant to business executives.
Effective Summer 2005 Effective Fall 2016
DEPARTMENT OF CHEMISTRY

CEM 484  Molecular Thermodynamics
Spring of every year. 3(4-0)  P: (MTH 235 or MTH 255H or MTH 340 or MTH 347H) and (CEM 142 or CEM 152 or CEM 182H or LB 172)  P: (MTH 235 or MTH 340 or MTH 347H) and (CEM 142 or CEM 152 or CEM 182H or LB 172)  RB: CEM 483
Microscopic properties of atoms and molecules revealed by spectroscopic measurements; connection between thermodynamic properties of macroscopic chemical systems and microscopic properties established using statistical thermodynamics.
SA: CEM 361, CEM 391
Effective Spring 2013  Effective Spring 2016

CEM 495  Molecular Spectroscopy
Fall of every year. 2(1-4)  P: (CEM 483 or CEM 484) and (CEM 395 or CEM 499) and ((CEM 262 or CEM 186H) and completion of Tier I writing requirement)  P: (CEM 483 or CEM 484) and (CEM 395 or CEM 499) and (CEM 262 and completion of Tier I writing requirement)
Experiments in magnetic resonance, optical, and vibrational spectroscopies.
SA: CEM 472
Effective Fall 2013  Effective Fall 2015

CEM 499  Chemical Physics Seminar
Spring of every year. 1(1-0)  A student may earn a maximum of 2 credits in all enrollments for this course.  P: ((PHY 215) and completion of Tier I writing requirement) and (MTH 235 or MTH 255H or MTH 340 or MTH 347H)  P: ((PHY 215) and completion of Tier I writing requirement) and (MTH 235 or MTH 340 or MTH 347H)
Written and oral reports on selected journal articles in chemical physics.
Effective Spring 2013  Effective Fall 2015

COLLEGE OF COMMUNICATION ARTS AND SCIENCES

CAS 110  Creative Processes in Media Settings Creative Thinking
Fall of every year. Spring of every year. Summer of every year. 2(2-0) 3(3-0)  R: Open to undergraduate students in the Department of Advertising and Public Relations or in the School of Journalism or in the Department of Media and Information.
The creative process, where ideas come from and why humans create, inspiration from intuition and intellect, the material and immaterial, theories, vocabulary, grammar and tools of creativity, particularly in communication settings. Theory and practice for utilizing creative and critical thinking skills to generate unique ideas to solve complex problems and generate unique media content.
SA: ADV 220
Effective Fall 2015  Effective Fall 2016

CAS 111  Creativity and Design: Form, Content and Meaning Design and Layout
Fall of every year. Spring of every year. 2(2-0) 3(2-2)  R: Open to undergraduate students in the Department of Advertising, Public Relations and Retailing or in the School of Journalism or in the Department of Media and Information. R: Open to undergraduate students in the Department of Advertising, Public Relations and Retailing or in the School of Journalism or in the Department of Media and Information.
Visual literacy from primitive marks made by humans to the latest communication technology. Understanding symbols, images, icons, and metaphors in communication settings. Fundamentals of design practices and creative thinking for media related projects. Understanding and application of elements and principles of design, form, content and meaning, composition, color theory, typography, and the grid. Includes Adobe applications: Photoshop, Illustrator and InDesign.
SA: TC 242
Effective Fall 2015  Effective Fall 2016
CAS 112  Story, Sound and Motion
Fall of every year, Spring of every year. Summer of every year. 2(2-0) 3(2-2) R: Open to undergraduate students in the Department of Advertising and Public Relations or in the School of Journalism or in the Department of Media and Information.
- Central role of storytelling in human communication from the earliest oral traditions through the most recent mediated communication. Explore the central role of storytelling, sound and editing in media communication.
SA: TC 243
Effective Fall 2015  Effective Fall 2016

CAS 114  Creativity and Innovative Entrepreneurship
Fall of every year. Spring of every year. Summer of every year. 3(3-0) Interdepartmental with Arts and Letters. Not open to students with credit in CAS 110.
- Creative processes, complex problem solving and innovative entrepreneurship.
- Examination of successful social, cultural and corporate thinkers and creators. Activities focused on inquiry, observation, experimentation and networking for situational problem solving.
Effective Spring 2016  Effective Summer 2016

CAS 201  Audio and Video in Media Settings I
Fall of every year. Spring of every year. Summer of every year. 1(1-0) R: CAS 110 or CAS 111 or CAS 112 or JRN 203 R: Open to undergraduate students in the Department of Advertising and Public Relations or in the Department of Media and Information or in the School of Journalism or in the Design Specialization or in the Documentary Studies Specialization or in the Fiction Film Production Specialization.
- Professional video/audio techniques, technologies, standards, aesthetics, and procedures.
SA: TC 340
Effective Fall 2015  Effective Fall 2016

CAS 202  Audio and Video in Media Settings II
Fall of every year. Spring of every year. Summer of every year. 1(0-2) R: CAS 110 or CAS 111 or CAS 112 or JRN 203 R: Open to undergraduate students in the Department of Advertising and Public Relations or in the School of Journalism or in the Department of Media and Information or in the Design Specialization or in the Documentary Studies Specialization or in the Fiction Film Production Specialization.
- Advanced professional video/audio techniques, technologies, standards, aesthetics and procedures.
Effective Fall 2015  Effective Fall 2016

CAS 203  Design in Media Settings
Fall of every year. Spring of every year. Summer of every year. 1(1-0) R: CAS 110 or CAS 111 or CAS 112 or JRN 203 R: Open to undergraduate students in the Department of Advertising and Public Relations or in the School of Journalism or in the Department of Media and Information.
- Essential techniques for creating single and multiple page layouts for print communication products.
Effective Fall 2015  Effective Fall 2016

CAS 204  Web Design in Media Settings
Fall of every year. Spring of every year. Summer of every year. 1(1-0) R: CAS 110 or CAS 111 or CAS 112 or JRN 203 R: Open to undergraduate students in the Department of Advertising and Public Relations or in the School of Journalism or in the Department of Media and Information.
- Professional web authoring techniques including technology standards, aesthetics and production in media settings.
Effective Fall 2015  Effective Fall 2016
CSD 213  Anatomy and Physiology of the Speech and Hearing Mechanisms
Fall of every year. Spring of every year. 3(3-0) P: CSD 213 or concurrently RB: Completion of one ISP course. Completion of the University mathematics requirement.
Structural and functional analyses of the central and peripheral auditory mechanisms, and of the respiratory, phonatory, and articulatory mechanisms for speech.
SA: ASC 214
Effective Fall 2015 Effective Fall 2016

CSD 303  Fundamentals of Hearing
Fall of every year. 3(3-0) P: CSD 213 or concurrently RB: Completion of one ISP course. Completion of the University mathematics requirement.
SA: ASC 303, ASC 255
Effective Fall 2015 Effective Fall 2016

CSD 313  Speech Science
Fall of every year. Spring of every year. 3(3-0) P: CSD 213 or concurrently RB: Completion of one ISP course. Completion of the University mathematics requirement.
Processes underlying the production and perception of speech.
SA: ASC 313, ASC 255
Effective Fall 2015 Effective Fall 2016

CSD 333  Oral Language Development
Fall of every year. Spring of every year. Summer of every year. 3(3-0) P: PSY 101 or LIN 200 or LIN 401 or ENG 302 R: Not open to freshmen.
Development of receptive and expressive aspects of child language.
SA: ASC 333
Effective Fall 2015 Effective Fall 2016

CSD 344  Evaluation Procedures in Audiology
Spring of every year. 4(3-2) P: (CSD 303) and completion of Tier I writing requirement R: Open to undergraduate students in the Department of Communicative Sciences and Disorders or approval of department.
Classification of hearing disorders. Behavioral and electrophysiological measurement of hearing, including subjective and objective testing procedures.
SA: ASC 344
Effective Fall 2015 Effective Spring 2017

CSD 364  Speech and Language Disorders and their Evaluation
Fall of every year. Spring of every year. 3(3-0) P: CSD 213 P: CSD 313
SA: ASC 364
Effective Fall 2015 Effective Spring 2017
CSD 444  Audiologic Assessment and Intervention/Rehabilitation
Fall of every year. Spring of every year. 3(3-0) P: CSD 303
Clinical procedures in audiology.
SA: ASC 443
Effective Fall 2015 Effective Spring 2017

CSD 463  Intervention/Rehabilitation Procedures in Speech-Language Pathology
Spring of every year. 3(3-0) P: CSD 364 or concurrently P: CSD 313
Intervention and rehabilitation procedures for individuals with developmental and acquired communication disorders.
SA: ASC 463
Effective Fall 2015 Effective Spring 2017

CSD 473  Phonological Disorders in Children
Spring of every year. 3(3-0) P: CSD 364
Nature, basis, assessment, and treatment of developmental phonological disorders.
SA: ASC 473
Effective Fall 2015 Effective Fall 2016

CSD 819  Cognitive-Communicative Disorders
Spring of every year. Summer of every year. 3(0-0) P: CSD 813 and CSD 815 and CSD 865 P: CSD 813 R: Open to graduate students in the Department of Communicative Sciences and Disorders.
Neurophysiological, speech-language, cognitive, neuropsychological, and social/emotional rehabilitation associated with traumatic brain injury, dementia, and right hemisphere neurological disorders.
SA: ASC 823I, CSD 823I
Effective Fall 2012 Effective Spring 2016

CSD 821  Language Assessment and Intervention: Later Stages
Fall of every year. Summer of every year. 3(0-0) P: CSD 820 R: Open to graduate students in the Department of Communicative Sciences and Disorders.
Nature, characteristics, evaluation, assessment, diagnosis, and intervention for children with developmental language and related disorders from early school years through adolescence
SA: CSD 823G
Effective Fall 2012 Effective Fall 2016

CSD 823E  Assessment of Childhood Language Disorders
Fall of every year. 3(2-2) R: Open to graduate students in the Department of Communicative Sciences and Disorders.
Evaluation of language disorders of preschool, school-aged, and adolescent populations.
SA: ASC 823E
DELETE COURSE
Effective Fall 2016

CSD 840  Voice Disorders
Spring of every year. 3(3-0) P: CSD 813 R: Open to graduate students in the Department of Communicative Sciences and Disorders.
Etiology, symptomatology, diagnosis, and treatment of voice disorders in children and adults.
SA: ASC 823C, CSD 823C
Effective Fall 2012 Effective Spring 2016

CSD 850  Medical Aspects of Speech-Language Pathology
Fall of every year. Spring of every year. 3(2-2) P: CSD 813 and CSD 865 P: CSD 813 R: Open to graduate students in the Department of Communicative Sciences and Disorders. C: CSD 840 concurrently.
SA: ASC 823J, CSD 823J
Effective Fall 2012 Effective Spring 2016
CSD 855  Assessment and Treatment of Dysphagia
Spring of every year. Summer of every year. 3(3-0) P: CSD 813 RB: CSD 815 and CSD 840 P: Open to graduate students in the Department of Communicative Sciences and Disorders.

Introduction to assessment, intervention, and management of persons with swallowing disorders.
SA: ASC 823K, CSD 823K
Effective Fall 2012 Effective Spring 2016

CSD 865  Motor Speech Disorders
Fall of every year. Summer of every year. 3(3-0) P: CSD 813 or concurrently P: CSD 813 R: Open to graduate students in the Department of Communicative Sciences and Disorders.

Neuropathology, symptomatology, and speech-language habilitation and rehabilitation of individuals with motor speech disorders.
SA: ASC 823B, CSD 823B
Effective Fall 2012 Effective Summer 2016

DEPARTMENT OF COMPUTATIONAL MATHEMATICS, SCIENCE, AND ENGINEERING

NSC 801  CMSE 801 Introduction to Computational Science
Introduction to Computational Modeling
Fall of every year. 3(3-0) RB: One semester of introductory calculus

 Basics of computational science using a wide variety of application examples. Algorithmic thinking and model building, programming fundamentals, data visualization, numerical methods. Introduction to computational modeling using a wide variety of application examples. Algorithmic thinking and model building, data visualization, numerical methods, all implemented as programs. Command line interfaces. Scientific software development techniques including modular programming, testing, and version control.
SA: NSC 801
Effective Spring 2016 Effective Fall 2016

NSC 802  CMSE 802 Methods in Computational Science
Methods in Computational Modeling
Spring of every year. 3(3-0) RB: (NSC 801) or equivalent programming experience RB: (CMSE 801) or equivalent experience

SA: NSC 802
Effective Fall 2016

DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING

ECE 280  Electrical Engineering Analysis
Fall of every year. Spring of every year. 3(3-0) P: (MTH 234 or MTH 254H) and (ECE 201 or concurrently)

 Application of linear algebra, complex numbers, vectors, probability, and random processes to elementary problems in electrical and computer engineering. Application to signals, systems, noise, electromagnetics, and reliability. Modeling using standard software packages. Application of linear algebra, vectors, probability, and random processes to elementary problems in electrical and computer engineering. Application to signals, systems, noise, electromagnetics, and reliability. Modeling using standard software packages.
Effective Fall 2013 Effective Fall 2016
ECE 477  Microelectronic Fabrication
Fall of every year. 3(2-3) P: (ECE 474 or concurrently) and ECE 303 P: ECE 303 R: Open to juniors or seniors in the College of Engineering.
Microelectronic processing fundamentals and simulations. Comparison of current microfabrication technologies and their limitations.
SA: ECE 483  
Effective Fall 2013 Effective Fall 2016

DEPARTMENT OF ENTOMOLOGY

ENT 319  Introduction to Earth System Science
Fall of every year. 3(3-0) Interdepartmental with Geological Sciences and Plant Biology and Sociology and Zoology. Interdepartmental with Geological Sciences and Integrative Biology and Plant Biology and Sociology.
RB: Completion of one course in biological or physical science.
Systems approach to Earth as an integration of geochemical, geophysical, biological and social components. Global dynamics at a variety of spatio-temporal scales. Sustainability of the Earth system.
Effective Fall 2013 Effective Fall 2016

ENT 422  Aquatic Entomology
Fall of odd years. 3(2-3) Interdepartmental with Fisheries and Wildlife and Zoology. Interdepartmental with Fisheries and Wildlife and Integrative Biology.
P: BS 162
Biology, ecology and systematics of aquatic insects in streams, rivers and lakes. Field trips and aquatic insect collection required.
SA: ENT 420  
Effective Fall 2013 Effective Fall 2016

DEPARTMENT OF FINANCE

GBL 480  Environmental Law and Sustainability for Business: From Local to Global
Fall of every year. Spring of every year. Summer of odd years. 3(3-0) R: Open to juniors or seniors in the Eli Broad College of Business and The Eli Broad Graduate School of Management or in the Environmental and Sustainability Studies Minor and not open to undergraduate students in the School of Hospitality Business.
Environmental law and sustainability for business from comparative as well as local, national, and international perspectives.
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 Fall 2015 Effective Fall 2016

DEPARTMENT OF FISHERIES AND WILDLIFE

FW 410  Upland Ecosystem Management
Spring of every year. 3(2-3) P: (ZOL 355 or FOR 404) and completion of Tier I writing requirement.
P: (IBIO 355 or FOR 404) or completion of Tier I writing requirement
Analysis and management of upland ecosystems to meet wildlife management and biodiversity objectives. Mitigation of human impact. Field trips required.
Effective Fall 2014 Effective Fall 2016

FW 416  Marine Ecosystem Management
Fall of every year. 3(3-0) P: (ZOL 355) and completion of Tier I writing requirement.
P: (IBIO 355) and completion of Tier I writing requirement
RB: FW 110 or ZOL 303 or ZOL 353
RB: FW 110 or IBIO 303 or IBIO 355
Effective Fall 2014 Effective Fall 2016
FW 417  Wetland Ecology and Management
Fall of every year. 3(2-3) P: (ZOL 355) and completion of Tier I Writing requirement P: (IBIO 355) and completion of Tier I writing requirement
Biological, physical, and chemical processes controlling wetland structure and function. Utilization, mitigation, and conservation of wetlands on a sustainable basis.
SA: FW 412
Effective Fall 2014 Effective Fall 2016

FW 420  Stream Ecology
Fall of every year. 3(3-0) Interdepartmental with Zoology, Interdepartmental with Integrative Biology P: ZOL 355 or approval of department P: IBIO 355 or approval of department RB: CEM 141
Biological and environmental factors determining structure and function of stream ecosystems.
Effective Fall 2014 Effective Fall 2016

FW 424  Population Analysis and Management
Fall of every year. 4(3-2) P: ZOL 355 and (STT 224 or STT 331 or STT 421) and (MTH 124 or MTH 132 or LB 118) P: (IBIO 355) and (STT 224 or STT 331 or STT 421) and (MTH 124 or MTH 132 or LB 118)
Statistical, ecological and management concepts and methods needed to analyze and interpret demographic data and manage fish and wildlife populations.
Effective Fall 2014 Effective Fall 2016

FW 444  Conservation Biology
Spring of every year. 3(3-0) Interdepartmental with Zoology, Interdepartmental with Integrative Biology P: (ZOL 355 or FOR 404 or PLB 441) and completion of Tier I Writing requirement P: (IBIO 355 or FOR 404 or PLB 441) and completion of Tier I writing requirement
Ecological theories and methodologies to manage species, communities and genetic diversity on a local and global scale.
Effective Fall 2014 Effective Fall 2016

FW 454  Environmental Hydrology for Watershed Management
Spring of odd years. 3(3-0) P: (MTH 124 or MTH 132 or LB 118) and ((PHY 183 or concurrently) or (PHY 231 or concurrently)) RB: ZOL 355 or concurrently RB: IBIO 355 or concurrently
Effect of climate, topography, geology, soil, vegetation, and anthropogenic land uses on the amount, timing, and quality of water yield. Implications for fish and wildlife resource management. Field trips required.
Effective Fall 2014 Effective Fall 2016

FW 471  Ichthyology
Spring of every year. 4(3-3) Interdepartmental with Zoology, Interdepartmental with Integrative Biology P: ((BS 162 and BS 172) or (BS 182H and BS 192H) or LB 144) and Completion of Tier I Writing Requirement
Effective Fall 2014 Effective Fall 2016

FW 472  Limnology
Spring of every year. 3(3-0) Interdepartmental with Zoology, Interdepartmental with Integrative Biology P: (CEM 141 or LB 171) and ZOL 355 P: (CEM 141 or LB 171) and IBIO 355
Ecology of lakes with emphasis on interacting physical, chemical, and biological factors affecting their structure and function.
Effective Fall 2014 Effective Fall 2016

FW 474  Field and Laboratory Techniques for Aquatic Studies
Fall of every year. 3(2-3) Interdepartmental with Zoology, Interdepartmental with Integrative Biology P: (FW 101L or FW 238) and completion of Tier I writing requirement
Field and laboratory techniques for the investigation and analysis of lake and stream ecosystems and their biota. Field trips required.
SA: FW 470
Effective Fall 2014 Effective Fall 2016
PART III – COURSE CHANGES

FW 480  International Studies in Fisheries and Wildlife
Fall of every year. Spring of every year. Summer of every year. 1 to 6 credits. A student may earn a maximum of 12 credits in all enrollments for this course. **RB: ZOL 355 RB: IBIO 355 R:** Approval of department; application required.

Fisheries and wildlife ecology and management study in regions beyond the United States. Ecological, economic, social, and cultural influences on fisheries and wildlife resources.

**Effective Fall 2014 Effective Fall 2016**

FW 828  Conservation and Genetics
Molecular Ecology and Conservation Genetics
Fall of even years. (2-2) Interdepartmental with Plant Biology and Zoology. Interdepartmental with Integrative Biology and Plant Biology **RB:** ZOL 341 or CSS 350 or ANS 314 **RB:** IBIO 341 or CSS 350 or ANS 314

Population and evolutionary genetic principles applied to ecology, conservation, and management of fish and wildlife at the individual, population, and species level.

**Effective Fall 2002 Effective Fall 2016**

FW 849  Applied Bayesian Inference using Monte Carlo Methods for Quantitative Biologists
Fall of even years. 3(2-2) Interdepartmental with Animal Science and Statistics and Probability. **RB:** (STT 814 and ZOL 851) or equivalent courses. **RB:** (STT 814 and IBIO 851) or equivalent courses. **R:** Not open to undergraduate students.


**Effective Spring 2013 Effective Fall 2016**

FW 863  Wildlife Disease Ecology
Spring of even years. 3(3-0) Interdepartmental with Large Animal Clinical Sciences and Zoology. Interdepartmental with Integrative Biology and Large Animal Clinical Sciences **RB:** Additional course work in ecology, zoology, microbiology and environmental sciences. **R:** Open to graduate students. Not open to students with credit in FW 463.

Role of wildlife disease in ecological interactions, factors underlying pathogen emergence, mathematical modeling of infectious diseases, conservation medicine.

**Effective Spring 2014 Effective Fall 2016**

FW 877  Fish Population Dynamics
Fall of every year. Spring of every year. 3(3-3) (4(3-2) RB: Course in Ecology and Statistics. **R:** Open only to graduate students in the College of Agriculture and Natural Resources or College of Natural Science.

Quantitative analysis of fish populations. Evaluation, causes, and impacts of the rates of change in survival, growth, reproduction, and recruitment for fish populations and their yield.

**Effective Fall 1998 Effective Fall 2015**

DEPARTMENT OF FOOD SCIENCE AND HUMAN NUTRITION

FSC 813  Food Laws and Regulations in Latin America
Fall of every year. **Summer of every year. 3(3-0) RB:** (FSC 810) or food science, law, food safety, international development or related disciplines. **RB:** (FSC 810) or food law background. Not open to students with credit in LAW 810G.

Current issues that have shaped Latin American food regulation. Overview of regional characteristics. Basic food laws, agency responsibilities, product registration requirements, basic standards, food labeling, food safety, food additives, and food importation. Trade issues, international organizations, and commercial agreements.

**Effective Fall 2013 Effective Spring 2016**
DEPARTMENT OF GEOLOGICAL SCIENCES

GLG 433  Vertebrate Paleontology
Fall of even years. 4(3-2) Interdepartmental with Zoology, Interdepartmental with Integrative Biology
P: ZOL 328 or GLG 304 or ZOL 360 or ZOL 365 or ZOL 384 or ZOL 445 or GLG 434 or FW 471
Modern techniques of identification and interpretation of fossils.
Effective Fall 2014 Effective Fall 2016

GLG 434  Evolutionary Paleobiology
Fall of odd years. 4(3-2) Interdepartmental with Zoology, Interdepartmental with Integrative Biology
RB: BS 162 or GLG 304 or LB 144 or BS 182H
Patterns and processes of evolution known from the fossil record
Effective Fall 2014 Effective Fall 2016

DEPARTMENT OF HISTORY

HST 205A  The Ancient Mediterranean from 3000 BCE to 400 CE
Fall of odd years. 4(4-0)
Major social, cultural and political themes from the earliest civilizations of the Near East and Egypt to the fall of the Roman Empire in the West. Emergence of civilization in Mesopotamia and Egypt, roots of western religion in ancient Israel, rise of democracy in Athens, Greek and Roman art and literature, cosmopolitanism after Alexander, Roman Republic and Empire, the coming of Christianity.
SA: HST 205
DELETE COURSE
Effective Summer 2016

HST 205B  Europe in the Middle Ages from 400 to 1500
Spring of every year. 4(4-0)
 zie major political, cultural, social and economic developments and themes from the Germanic invasions through the Italian Renaissance. Germanic kingdoms, Carolingian empire and renaissance, revival of learning, crusades, rise of universities, medieval architecture and literature, formation of European states, black death, humanism.
SA: HST 205
DELETE COURSE
Effective Summer 2016

HST 332A  Europe in the Middle Ages, 400-1000
Fall of every year. 3(3-0)
DELETE COURSE
Effective Spring 2016

HST 332B  Europe in the Middle Ages, 1000-1300
Spring of every year. 3(3-0)
DELETE COURSE
Effective Spring 2016

HST 333  Europe in Crisis, 1300-1450
Fall of every year. 3(3-0)
DELETE COURSE
Effective Summer 2016
DEPARTMENT OF HORTICULTURE

HRT 460  Green Roofs and Walls
Fall of every year. Fall of every year. 4(1-0) 2(2-0) Interdepartmental with Fisheries and Wildlife and Geography and Planning, Design and Construction. P: HRT 203 or FW 101 or GEO 206 or PDC 120 or EGR 100 R: Open to juniors or seniors or graduate students.
Green roof and wall design and installation practices including plant species and substrates. Environmental impact, ecosystem services, integration with other environmental practices. Influence of economics, public policy, and industry organizations on the implementation of green roofs on a wide scale. Multidisciplinary nature of planning and implementation of successful green roof and wall projects.
Effective Fall 2014 Effective Fall 2016

SCHOOL OF HOSPITALITY BUSINESS

HB 321  Club Operations and Management
Spring of odd years. Spring of every year. 3(3-0) P: HB 105 RB: HB 100 R: Open to students in the School of Hospitality Business. R: Open to sophomores or juniors or seniors in the School of Hospitality Business.
Club operations and management. City, country, yacht, and athletic clubs.
SA: HB 211
Effective Spring 2013 Effective Fall 2016

HB 345L  Quantity Food Production Systems Laboratory
Fall of every year. Spring of every year. 1(0-2) P: HB 265 or concurrently or approval of school P: HB 265 and (HB 345 or concurrently) R: Open to juniors or seniors in the School of Hospitality Business. C: HB 345 concurrently.
Practical applications of organization in food and beverage operations. Product knowledge, especially purchasing, storing, preparing, and production in food service operations. Menu development and recipe management.
Effective Spring 2013 Effective Fall 2016

HB 349  Facilities Maintenance and Systems
Fall of every year. Spring of every year. 3(3-0) P: HB 237 R: Open to sophomores or juniors or seniors in the School of Hospitality Business.
Managing the physical plant of a hospitality business. Key systems, safety, preventive maintenance, energy conservation.
Effective Summer 2014 Effective Fall 2016

HB 405  Advanced Management of Food and Beverage Systems
Fall of every year. Spring of every year. 3(3-0) P: HB 267 and HB 345 R: Open to juniors or seniors in the School of Hospitality Business.
Design of food and beverage control systems, emphasis on product purchasing (policies, suppliers, selection and evaluation, determination of quality and quantity, ethics and use of technology), inventory management and issuing systems, revenue control procedures and equipment.
Effective Spring 2013 Effective Fall 2016

HB 473  Hospitality Business Analytics
Fall of every year. Spring of every year. 3(3-0) R: Open to juniors or seniors in the School of Hospitality Business.
Quantitative and analytical skills used to communicate key business information effectively. Study of how business modeling and data analytics can increase decision making efficacy. Course topics include but are not limited to sensitivity and scenario analysis, financial modeling and forecasting, and applied business statistics methods.
Effective Fall 2015 Effective Fall 2016

HB 491  Current Topics in Hospitality Business
Fall of every year. Spring of every year. On Demand. 1 to 6 credits. A student may earn a maximum of 9 credits in all enrollments for this course. R: Open to juniors or seniors in the School of Hospitality Business.
Emerging topics or issues confronting the hospitality service industry.
Effective Summer 2014 Effective Fall 2016
HB 492  Hospitality Business Real Estate Professional Skills Workshop  
Fall of every year. Spring of every year. 1 to 6 credits. A student may earn a maximum of 6 credits in all enrollments for this course.  
R: Open to juniors or seniors in the School of Hospitality Business.  
R: Open to students in the Hospitality Business Real Estate Investment Management Minor.  
Specific knowledge and analytical skills necessary to be successful in an analyst role with a consulting, real estate development, or investment advisory organization. Workshop topics include but are not limited to hospitality real estate investment, market valuation, Excel modeling, business writing, financing hospitality enterprises, asset management, and hotel industry data analytics.  
**Effective Fall 2015 Effective Fall 2016**

**DEPARTMENT OF HUMAN DEVELOPMENT AND FAMILY STUDIES**

HDFS 320  Interaction with Children in Groups  
Fall of every year. Spring of every year.  Summer of every year. 3(3-0) P: HDFS 211 R: Open to students in the Department of Human Development and Family Studies. C: HDFS 320L concurrently.  
Principles of verbal and non-verbal interaction in relation to children's behavior in groups.  
Focus on young children in early childhood programs.  
SA: FCE 320  
**Effective Summer 2014 Effective Fall 2016**

HDFS 320L  Interaction with Children-Laboratory  
Fall of every year. Spring of every year.  Summer of every year. 1(0-4) P: HDFS 211 R: Open to students in the Department of Human Development and Family Studies. C: HDFS 320 concurrently.  
Practice applying principles of interaction to individuals and small groups in early childhood programs.  
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 1 semester after the end of the semester of enrollment.  
SA: FCE 320L  
**Effective Summer 2014 Effective Fall 2016**

HDFS 321  Curriculum for Children (W)  
Fall of every year. Spring of every year.  Summer of every year. 3(3-0) P: (HDFS 320) and completion of Tier I writing requirement R: Open to students in the Department of Human Development and Family Studies. C: HDFS 321L concurrently.  
Child development principles and accreditation standards for designing curricula for early childhood programs. Planning and evaluating learning activities and programs.  
SA: FCE 321  
**Effective Summer 2014 Effective Fall 2016**

HDFS 321L  Curriculum for Children - Laboratory  
Fall of every year. Spring of every year.  Summer of every year. 1(0-4) P: HDFS 320L R: Open to students in the Department of Human Development and Family Studies. C: HDFS 321 concurrently.  
Supervised practice in providing learning activities for individual children and small groups. Planning, implementing, and evaluating activities. Field trips may be required.  
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.  
SA: FCE 321L  
**Effective Summer 2014 Effective Fall 2016**
HDFS 473  Administration of Early Childhood Programs  
**Fall of every year. Spring of every year.** 3(3-0)  
P: HDFS 320 or concurrently  
R: Open to juniors or seniors or graduate students in the Department of Human Development and Family Studies.  
Administrator's role in early childhood programs. Ecological focus on administrative relationships, regulations, fiscal and management skills, and developmentally appropriate practices.  
SA: FCE 473  
**Effective Summer 2014 Effective Fall 2016**

HDFS 811  Child Development: Ecological Perspectives  
**Fall of every even years. Fall of every odd years.** 3(3-0)  
Ecological factors that influence family functioning and child outcomes.  
SA: FCE 811  
**Effective Fall 2010 Effective Fall 2016**

HDFS 820  Infant Development: The Contexts of Family, Community, and Culture  
**Fall of every even years. Spring of every odd years.** 3(3-0)  
RB: Course in research methodology  
SA: FCE 820  
**Effective Fall 2010 Effective Fall 2016**

HDFS 821  Prevention, Intervention and Educational Programs in Early Childhood  
**Fall of every even years. Spring of every odd years.** 3(3-0)  
RB: Course in research methodology  
**Effective Fall 2010 Effective Fall 2016**

HDFS 902  Advanced Couple and Family Therapy Theories  
Fall of every year. Spring of every year. 3(3-0)  
A student may earn a maximum of 12 credits in all enrollments for this course.  
RB: HDFS 830  
Selected theoretical perspectives in couple and family therapy and related therapy techniques. Topics vary.  
SA: FCE 902  
**DELETE COURSE**  
**Effective Summer 2016**

HDFS 924  Quantitative Observational Methods for Studying Behavior and Development  
**Fall of every odd years. Fall of every even years.** 3(3-0)  
RB: Basic, graduate level, research methods  
Methodologies for observational research in study of human behavior and development. Measurement design and application, reliability and validity, analysis of resulting data.  
**Effective Fall 2011 Effective Fall 2016**

HM 612  Pain Medicine  
Fall of every year. Spring of every year. Summer of every year. 6(6-0)  
A student may earn a maximum of 18 credits in all enrollments for this course.  
P: SUR 608 and MED 608  
R: Open to students in the College of Human Medicine.  
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 2014 Effective Summer 2016**
DEPARTMENT OF INTEGRATIVE BIOLOGY

ZOL 101  Preview of Zoology  Exploring Biology
Fall of every year. Spring of every year. 1(1-0) R: Open to freshmen in the Zoology Major. R: Open to freshmen or sophomores in the Department of Integrative Biology or in the Environmental Biology/Zoology Major or in the Bachelor of Science in Zoology or in the Bachelor of Arts in Zoology.
Zoology as a discipline. Availability of diverse career options. Integration of human and technical skills in scientific problem solving. Biology as a discipline. Investigation of diverse career options and of skills and background knowledge required to be a modern biologist. Integration of human and technical skills in scientific scholarship and inquiry.
SA: ZOL 101
Effective Spring 2014  Effective Fall 2016

ZOL 303  Oceanography
Fall of every year. 4(4-0) Interdepartmental with Geological Sciences. P: (CEM 141 or CEM 181H or LB 171 or CEM 151) and (PHY 231 or PHY 183 or PHY 193H or LB 273 or PHY 183B or PHY 231C)
Physical, chemical, biological, and geological aspects of oceanography: ocean circulation, waves, tides, air-sea interactions, chemical properties of ocean water, ocean productivity, shoreline processes, and sediments.
SA: ZOL 303
Effective Spring 2014  Effective Fall 2016

ZOL 306  Invertebrate Biology
Fall of every year. 4(3-3) P: BS 162 or LB 144 or BS 182H
Systematics, morphology, and natural history of invertebrate animals. Identification of live and preserved specimens. Recognition of selected groups.
SA: ZOL 306
Effective Spring 2014  Effective Fall 2016

ZOL 313  Animal Behavior
Fall of every year. Spring of every year. Summer of every year. 3(3-0) P: BS 162 or LB 144 or BS 182H R: Not open to freshmen.
Development, physiological mediation, adaptive significance and evolution of behavior.
SA: ZOL 213, ZOL 313
Effective Spring 2014  Effective Fall 2016

ZOL 316  General Parasitology
Spring of every year. 3(3-0) P: LB 144 or BS 162 or BS 182H
Identification, life history, host-parasite relationships, and epidemiology of protozoan, helminth, acanthocephalan, copepod, and arthropod parasites of animals and humans.
SA: ZOL 316
Effective Spring 2014  Effective Fall 2016

ZOL 320  Developmental Biology
Fall of every year. 4(3-3) P: (BS 161 or LB 145 or BS 181H) and (BS 162 or LB 144 or BS 182H)
Principles of development, emphasizing vertebrates. Illustrations from morphological and experimental investigations.
SA: ZOL 320, ZOL 320, ZOL 320
Effective Spring 2014  Effective Fall 2016
PART III – COURSE CHANGES

ZOL 328
IBIO 328
Comparative Anatomy and Biology of Vertebrates (W)
Spring of every year. 4(3-3) P: (BS 162 or LB 144 or BS 182H) and completion of Tier I writing requirement
Comparative morphology and natural history of vertebrates. Dissection of representatives of most vertebrate classes.
SA: ZOL 228 SA: ZOL 228, ZOL 328
Effective Spring 2014 Effective Fall 2016

ZOL 341
IBIO 341
Fundamental Genetics
Fall of every year. Spring of every year. Summer of every year. 4(4-0) Interdepartmental with Plant Biology. P: BS 161 or LB 145 or BS 181H
Principles of heredity in animals, plants and microorganisms. Classical and molecular methods in the study of gene structure, transmission, expression and evolution.
SA: ZOL 341
Effective Fall 2012 Effective Fall 2016

ZOL 343
IBIO 343
Genetics Laboratory
Spring of every year. 3(0-6) P: (ZOL 341 or concurrently) and completion of Tier I writing requirement P: (IBIO 341 or concurrently) and completion of Tier I writing requirement
Experiments involving genetics of Drosophila and other eucaryotic organisms.
SA: ZOL 343
Effective Spring 2014 Effective Fall 2016

ZOL 353
IBIO 353
Marine Biology (W)
Fall of every year. 4(4-0) P: (BS 162 or LB 144 or BS 182H) and completion of Tier I writing requirement
Analysis of marine and estuarine systems. Integration of biology, chemistry, and physics.
Life histories of marine organisms. Biology of special marine habitats including rocky intertidal zones, upwellings, coral reefs and deep sea.
SA: ZOL 353
Effective Spring 2014 Effective Fall 2016

ZOL 355
IBIO 355
Ecology
Fall of every year. Spring of every year. Summer of every year. 3(3-0) Interdepartmental with Plant Biology. P: BS 162 or LB 144 or BS 182H
Interrelationships of plants and animals with each other and the environment. Principles of individual, population, community, and ecosystem ecology. Application of ecological principles to global change and other anthropogenic stressors.
SA: ZOL 350 SA: ZOL 250, ZOL 355
Effective Spring 2014 Effective Fall 2016

ZOL 355L
IBIO 355L
Ecology Laboratory (W)
Fall of every year. Spring of every year. Summer of every year. 1(0-3) Interdepartmental with Plant Biology. P: (ZOL 355 or concurrently) and completion of Tier I writing requirement P: (IBIO 355 or concurrently) and completion of Tier I writing requirement
Population, community, and ecosystem ecology, utilizing plant and animal examples to demonstrate general field principles.
SA: ZOL 355L
Effective Spring 2014 Effective Fall 2016
ZOL 357
IBIO 357
Global Change Biology (W)
Spring of every year. 3(3-0) P: ZOL 355 and completion of Tier I writing requirement P: IBIO 355 and completion of Tier I writing requirement RB: Intended for science or engineering majors R: Not open to freshmen.
Causes and consequences of modes of contemporary global change that are caused by biological systems or impact biological systems. Theories, evidence, and predictions in global warming, ocean acidification, desertification, eutrophication, food security, and mass extinction.
SA: ZOL 357
Effective Spring 2016 Effective Fall 2016

ZOL 360
IBIO 360
Biology of Birds
Fall of every year. 4(3-3) P: BS 162 or LB 144 or BS 182H
Behavior, ecology, evolution, and systematics of birds; biodiversity. Laboratories emphasize diversity of form and function, life history patterns, and identification.
SA: ZOL 360
Effective Spring 2014 Effective Fall 2016

ZOL 365
IBIO 365
Biology of Mammals
Spring of every year. 4(3-3) P: BS 162 or LB 144 or BS 182H
Analysis of the behavior, ecology, evolution, and systematics of mammals. Laboratories emphasize diversity of form and function, life history patterns, and identification.
SA: ZOL 365
Effective Spring 2014 Effective Fall 2016

ZOL 369
IBIO 369
Introduction to Zoo and Aquarium Science
Spring of every year. 3(3-0) Interdepartmental with Fisheries and Wildlife and Landscape Architecture and Veterinary Medicine. P: BS 162 or LB 144 or BS 182H
Fundamentals of zoo and aquarium operations including research, interpretation, design, nutrition, captive breeding, conservation, ethics and management.
SA: ZOL 369
Effective Spring 2014 Effective Fall 2016

ZOL 370
IBIO 370
Introduction to Zoogeography
Fall of every year. 3(3-0) Interdepartmental with Fisheries and Wildlife and Geography. P: ZOL 355 P: IBIO 355
Patterns of geographical distribution of animals and the ecological and historical processes leading to these patterns.
SA: ZOL 370
Effective Fall 2014 Effective Fall 2016

ZOL 384
IBIO 384
Biology of Amphibians and Reptiles (W)
Fall of every year. 4(3-3) P: (BS 162 or LB 144 or BS 182H) and completion of Tier I writing requirement
The evolution, systematics, ecology, and behavior of amphibians and reptiles. Laboratory emphasizes diversity and identification of families and Great Lakes species. Field trips may be required.
SA: ZOL 384
Effective Spring 2014 Effective Fall 2016

ZOL 390
IBIO 390
Practicum in Zoo/Aquarium Careers
Summer of every year. 4 credits.
Practical application of science, business and education methods through typical workdays with zoo professionals.
SA: ZOL 390
Effective Spring 2014 Effective Fall 2016
ZOL 400H
IBIO 400H
Honors Work
Fall of every year. Spring of every year. 1 to 5 credits. A student may earn a maximum of 5 credits in all enrollments for this course. R: Not open to freshmen or sophomores.
Honors work on a topic in zoology.
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.
SA: ZOL 400H
Effective Spring 2014
Effective Fall 2016

ZOL 402  
IBIO 402  
Neurobiology
Fall of every year. Spring of every year. 3(3-0) P: (BS 162 or LB 144 or BS 182H) and (BS 161 or LB 145 or BS 181H) R: Not open to freshmen or sophomores and not open to students in the Program in Neuroscience and not open to students in the Lyman Briggs Neuroscience Major.
Structure and function of nerve cells and nervous systems.
SA: ZOL 402
Effective Spring 2014
Effective Fall 2016

ZOL 403  
IBIO 403  
Integrative Neurobiology
Spring of odd years. 3(3-0) P: ZOL 402 or PSY 209 P: IBIO 402 or PSY 209 RB: Junior or Senior level
How the nervous system has evolved mechanisms to determine the location and significance of physical and social sensory information. Epigenetic factors that guide nervous system development.
SA: ZOL 403
Effective Spring 2014
Effective Fall 2016

ZOL 405  
IBIO 405  
Neural Basis of Animal Behavior
Spring of every year. 3(3-0) P: (BS 161 or LB 145 or BS 181H) and (BS 162 or LB 144 or BS 182H)
Structure and function of neurons and neural circuits underlying naturally-occurring animal behaviors.
SA: ZOL 405
Effective Spring 2016
Effective Fall 2016

ZOL 408  
IBIO 408  
Histology
Fall of every year. 4(3-3) P: BS 161 or LB 145 or BS 181H
Structure of cells and their interactions to form tissues.
SA: ZOL 350 SA: ZOL 350, ZOL 408
Effective Spring 2014
Effective Fall 2016

ZOL 415  
IBIO 415  
Ecological Aspects of Animal Behavior (W)
Fall of every year. 3(3-0) P: (ZOL 313) and completion of Tier I writing requirement
Advanced topics in the ecology and evolution of animal behavior.
SA: ZOL 415
Effective Spring 2014
Effective Fall 2016

ZOL 425  
IBIO 425  
Cells and Development (W)
Spring of every year. 4(3-3) P: (BS 161 and BS 171) or LB 145 or ((BS 181H and BS 191H) and completion of Tier I writing requirement)
The role of cells in growth, differentiation and development of animals from protozoa to mammals.
SA: ZOL 221 SA: ZOL 221, ZOL 425
Effective Spring 2014
Effective Fall 2016
ZOL 440  IBIO 440  
Field Ecology and Evolution  
Summer of every year. 4 credits. Interdepartmental with Plant Biology. P: ZOL 355 P: IBIO 355  
Solving conceptual and practical research problems in ecology and evolution under field conditions.  
SA: ZOL 440  
Effective Spring 2014 Effective Fall 2016

ZOL 445  IBIO 445  
Evolution (W)  
Fall of every year. Spring of every year. Summer of every year. 3(3-0) Interdepartmental with Crop and Soil Sciences and Plant Biology. P: (ZOL 341 or CSS 350) and completion of Tier I writing requirement P: (IBIO 341 or CSS 350) and completion of Tier I writing requirement R: Not open to freshmen.  
SA: ZOL 445 SA: ZOL 345 ZOL 445  
Effective Spring 2014 Effective Fall 2016

ZOL 446  IBIO 446  
Environmental Issues and Public Policy  
Fall of every year. 3(3-0) Interdepartmental with Environmental Studies and Applications. Interdepartmental with Community Sustainability R: Not open to freshmen or sophomores.  
Interrelationship of science and public policy in resolving environmental issues. Technical, social, economic, and legal influences. Case study approach.  
SA: ZOL 446  
Effective Spring 2014 Effective Fall 2016

ZOL 450  IBIO 450  
Cancer Biology (W)  
Spring of every year. 3(3-0) P: (BMB 200 or BMB 401 or ZOL 425) or (BMB 461 and BMB 462) and completion of Tier I writing requirement P: (BMB 200 or BMB 401 or IBIO 425) or ((BMB 461 and BMB 462) and completion of Tier I writing requirement)  
SA: ZOL 450  
Effective Spring 2014 Effective Fall 2016

ZOL 483  IBIO 483  
Environmental Physiology (W)  
Spring of every year. 4(4-0) P: ((BS 161 or LB 145 or BS 181H) and completion of Tier I writing requirement) and (BS 162 or LB 144 or BS 182H) and (CEM 141 or CEM 151 or CEM 181H or LB 171)  
Aspects of physiology important to the environmental relations of vertebrates and invertebrates: energetics, thermal relations, osmotic-ionic relations, and exercise physiology.  
SA: ZOL 483  
Effective Spring 2014 Effective Fall 2016

ZOL 485  IBIO 485  
Tropical Biology Tropical Biology (W)  
Fall of every year. 3(3-0) Interdepartmental with Plant Biology. P: ZOL 355 P: (IBIO 355) and completion of Tier I writing requirement R: Open to juniors or seniors.  
Tropical biota emphasizing evolutionary and ecological principles compared across tropical ecosystems.  
SA: ZOL 485  
Effective Summer 2015 Effective Fall 2016
ZOL 489
IBIO 489  Seminar in Zoo and Aquarium Science
Fall of every year. Spring of every year. 1(1-0) Interdepartmental with Fisheries and Wildlife and Landscape Architecture. Interdepartmental with Community Sustainability and Fisheries and Wildlife and Landscape Architecture A student may earn a maximum of 3 credits in all enrollments for this course. R: Approval of department.
Scientific writing and oral presentations related to zoo and aquarium studies.
SA: ZOL 489  
Effective Spring 2014 Effective Fall 2016

ZOL 490
IBIO 490  Overseas Study in Zoology
Fall of every year. Spring of every year. Summer of every year. 3 to 6 credits. A student may earn a maximum of 6 credits in all enrollments for this course. P: (BS 162 or LB 144 or BS 182H) and (BS 161 or LB 145 or BS 181H) R: Open to seniors or graduate students. Approval of department.
Topical problems course in Zoology or coordinated by Zoology faculty in foreign countries.
SA: ZOL 490  
Effective Spring 2014 Effective Fall 2016

ZOL 494
IBIO 494  Independent Study
Fall of every year. Spring of every year. Summer of every year. 1 to 6 credits. A student may earn a maximum of 8 credits in all enrollments for this course. R: Approval of department.
Supervised research on a topic not normally covered in the classroom.
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.
SA: ZOL 494  
Effective Spring 2014 Effective Fall 2016

ZOL 495
IBIO 495  Undergraduate Seminar
Fall of every year. Spring of every year. 1(1-0) A student may earn a maximum of 3 credits in all enrollments for this course. R: Open to seniors in the Zoology Major.
Economic, social and environmental impact of current developments in Zoology.
SA: ZOL 495  
Effective Spring 2014 Effective Fall 2016

ZOL 496
IBIO 496  Internship in Zoology
Fall of every year. Spring of every year. Summer of every year. 4 credits. A student may earn a maximum of 8 credits in all enrollments for this course. R: Open to seniors. Approval of department.
Practical experience applying zoology training in a setting outside the University.
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.
SA: ZOL 496  
Effective Spring 2014 Effective Fall 2016

ZOL 497
IBIO 497  International Internship in Zoo and Aquarium Science
Fall of every year. Spring of every year. Summer of every year. 4 credits. A student may earn a maximum of 8 credits in all enrollments for this course. RB: Biological Sciences R: Open to juniors or seniors or graduate students. Approval of department; application required. R: Open to juniors or seniors or graduate students. Approval of department; application required. A student may earn a maximum of 8 credits IBIO 496, IBIO 497, IBIO 498
Application of zoological experience in a zoo or aquarium setting outside the United States.
SA: ZOL 497  
Effective Spring 2014 Effective Fall 2016
ZOL 498
IBIO 498
Internship in Zoo and Aquarium Science
Fall of every year. Spring of every year. Summer of every year. 4 credits. Interdepartmental with Fisheries and Wildlife and Landscape Architecture. A student may earn a maximum of 8 credits in all enrollments for this course. R: Open to juniors or seniors. Approval of department. Application of zoological experience in a zoo or aquarium setting outside the university. 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.
SA: ZOL 498
Effective Spring 2014 Effective Fall 2016

ZOL 801
IBIO 801
Professional Development
Fall of every year. 1(2-0) R: Open only to graduate students in the Department of Zoology. R: Open to graduate students in the Department of Integrative Biology. Ethical conduct in research. Selecting research topics and approaches. Scientific writing, grantsmanship, and publication. Career paths inside and outside academia.
SA: ZOL 801
Effective Fall 2005 Effective Fall 2016

ZOL 822
IBIO 822
Topics in Ethology and Behavioral Ecology
Spring of odd years. 3(3-0) A student may earn a maximum of 6 credits in all enrollments for this course. RB: ZOL 415 RB: IBIO 415 R: Open only to graduate students. Critical analysis through seminar-discussions of the primary research literature.
SA: ZOL 822
Effective Fall 1995 Effective Fall 2016

ZOL 824
IBIO 824
Stable Isotope Biogeochemistry
Spring of even years. 2(1-2) Interdepartmental with Geological Sciences. RB: CEM 142 or CEM 152 or CEM 182H or LB 171 Principles of stable isotope chemistry applied to biogeochemical problems: climate change, ecology, contaminants, oceanography, limnology, and paleobiology.
SA: ZOL 824
Effective Fall 2008 Effective Fall 2016

ZOL 832
IBIO 832
Evolution of Nervous Systems
Spring of odd years. 3(3-0) Interdepartmental with Neuroscience. RB: Background in neurobiology or evolutionary biology recommended. R: Open to graduate students in the Department of Computer Science and Engineering or in the Program in Neuroscience or in the Department of Psychology or in the Department of Zoology or approval of department. R: Open to graduate students in the Department of Computer Science and Engineering or in the Department of Integrative Biology or in the Program in Neuroscience or in the Department of Psychology or approval of department. Evolutionary origins, mechanisms, and consequences of evolutionary change in nervous systems.
SA: ZOL 832
Effective Spring 2013 Effective Fall 2016

ZOL 848
IBIO 848
Current Topics in Evolutionary Development Biology
Spring of every year. 3(3-0) RB: (ZOL 445 or ZOL 320 or ZOL 425 or ZOL 341) or background in evolutionary biology or developmental biology. RB: (IBIO 445 or IBIO 320 or IBIO 425 or IBIO 341) or background in evolutionary biology or developmental biology. Genetic and developmental basis for evolutionary change. Synthesis of molecular and developmental genetics with evolutionary biology. Discussion of primary literature in evolutionary development.
SA: ZOL 848
Effective Spring 2008 Effective Fall 2016
ZOL 851
IBIO 851
Statistical Methods for Ecology and Evolution
Fall of every year. 3(2-2) Interdepartmental with Plant Biology. RB: (STT 814) or an equivalent course.
Statistical modeling and interpretation of biological data using computationally intensive methods for estimation and inference. General linear models, mixed and process models, and estimation strategies applied to students using their own data using the R language.
SA: ZOL 851
Effective Fall 2010 Effective Fall 2016

ZOL 855
IBIO 855
Molecular Evolution: Principles and Techniques
Fall of odd years. 3(3-0) 3(2-2) Interdepartmental with Microbiology and Molecular Genetics and Plant Biology. RB: ZOL 341 or ZOL 445 RB: IBIO 341 or IBIO 445
Current techniques used to characterize and compare genes and genomes. Genetic variation, assays of variation. Data analysis and computer use to conduct a phylogenetic analysis to compare organisms and infer relationships.
SA: ZOL 855
Effective Fall 2002 Effective Fall 2016

ZOL 867
IBIO 867
Nature and Practice of Cognitive Science
Spring of every year. 3(3-0) Interdepartmental with Computer Science and Engineering and Linguistics and Philosophy and Psychology. RB: Undergraduate course work in behavioral biology, cognitive psychology, philosophy, linguistics, or artificial intelligence.
Survey of how different disciplines explore the cognitive processes underlying intelligent behavior.
SA: ZOL 867
Effective Spring 2003 Effective Fall 2016

ZOL 890
IBIO 890
Special Problems
Fall of every year. Spring of every year. Summer of every year. 1 to 3 credits. A student may earn a maximum of 10 credits in all enrollments for this course. R: Approval of department.
Current problems in Zoology.
SA: ZOL 890
Effective Fall 1992 Effective Fall 2016

ZOL 891
IBIO 891
Current Topics in Ecology and Evolution
Summer of every year. 1 to 2 credits. Interdepartmental with Crop and Soil Sciences and Plant Biology. A student may earn a maximum of 10 credits in all enrollments for this course.
Presentation and critical evaluation of theoretical and empirical developments in ecology and evolutionary biology by visiting scientists.
Request the use of the Pass-No Grade (P-N) system.
SA: ZOL 891
Effective Summer 2005 Effective Fall 2016

ZOL 895
IBIO 895
Seminar
Fall of every year. Spring of every year. 1(1-0) A student may earn a maximum of 6 credits in all enrollments for this course.
Graduate seminar on current research topics in Zoology.
SA: ZOL 895
Effective Fall 1992 Effective Fall 2016

ZOL 896
IBIO 896
Population and Community Ecology
Fall of every year. 4(4-0) Interdepartmental with Plant Biology.
Population dynamics of animals and plants utilizing life tables and projection matrices.
SA: ZOL 896
Effective Fall 2002 Effective Fall 2016
ZOL 897  
**Ecosystem Ecology and Global Change**  
Spring of odd years. 4(4-0) Interdepartmental with Fisheries and Wildlife and Plant Biology.  
Structure and function of natural ecosystems and their responses to global environmental change. Biogeochemical cycles, food webs, energy flow, nutrient cycling, and ecosystem management and restoration.  
SA: ZOL 897  
*Effective Spring 2011 Effective Fall 2016*

ZOL 899  
**Master's Thesis Research**  
Fall of every year. Spring of every year. Summer of every year. 1 to 6 credits. A student may earn a maximum of 36 credits in all enrollments for this course.  
Master's thesis research.  
Request the use of ET-Extension to postpone grading.  
The work for the course must be completed and the final grade reported within 30 semesters after the end of the semester of enrollment.  
SA: ZOL 899  
*Effective Summer 2002 Effective Fall 2016*

LCS 562  
**Care and Management of the Neonatal Foal**  
Spring of every year. 1(1-0) RB: Completion of year 1 in the graduate professional curriculum. R: Open to graduate-professional students in the College of Veterinary Medicine.  
Weekly seminars focusing on common diseases. Case presentations.  
Request the use of the Pass-No Grade (P-N) system.  
*Effective Spring 2009 Effective Spring 2016*

LCS 563  
**Bovine Pregnancy Diagnosis**  
Fall of every year. 1(1-1) RB: Completion of year 2 in the graduate professional curriculum. R: Open to graduate-professional students in the College of Veterinary Medicine.  
Basic reproductive physiology. Farm based laboratories in bovine transrectal palpation and sonography. Field trips required.  
Request the use of the Pass-No Grade (P-N) system.  
*Effective Spring 2009 Effective Fall 2016*

LCS 565  
**Equine Sports Medicine**  
Fall of odd years. Fall of every year. 1(1-0) RB: Completion of year 2 in the graduate professional curriculum. R: Open to graduate-professional students in the College of Veterinary Medicine.  
Physiologic responses to exercise and discipline specific disorders of equine athletes.  
Request the use of the Pass-No Grade (P-N) system.  
*Effective Spring 2009 Effective Fall 2016*
LCS 621  Equine Practice Clerkship
Practice Based Ambulatory Clerkship
Fall of every year. Spring of every year. Summer of every year. 3 credits. RB: Completion of semester 5 of the graduate-professional program in the College of Veterinary Medicine. R: Open to graduate-professional students in the College of Veterinary Medicine.
- Supervised, off-campus experience in an assigned veterinary practice. Regular equine and food animal farm calls. After-hours emergencies. Veterinary practice management.
- 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 1 semester after the end of the semester of enrollment.

Effective Fall 2013  Effective Summer 2016

MSU COLLEGE OF LAW

LAW 501D  Decedent’s Estates and Trusts
Trusts and Estates
Fall of every year. Spring of every year. 0 to 6 credits. R: Open to students in the MSU College of Law. R: Open to Law students or master of laws students or law lifelong students or law non-degree students in the MSU College of Law.
- A survey of practices for transmitting wealth in view of death.
SA: DCL 210
Effective Summer 2014  Effective Fall 2016

LAW 506F  Chapter 11 Reorganization
Fall of every year. Spring of every year. Summer of every year. 1 to 4 credits. 0 to 6 credits. P: LAW 506E R: Open to Law students or master of laws students or law lifelong students or law non-degree students. R: Open to Law students or master of laws students or law lifelong students or law non-degree students.
- In-depth look at reorganization under Chapter 11 of the Bankruptcy Code.
SA: LAW 506C
Effective Summer 2009  Effective Summer 2016

LAW 508D  Corporate Law & Policy Seminar
Advanced Corporate Law
Fall of every year. Spring of every year. 2 to 4 credits. 0 to 6 credits. R: Open to students in the MSU College of Law. R: Open to Law students or master of laws students or law lifelong students or law non-degree students in the MSU College of Law.
- A seminar covering corporate law topics chosen to allow students to engage in deeper logic of corporate law. Emphasis is placed on issues raised by policy makers & scholars.
- Corporate law topics with emphasis on issues raised by policy makers and scholars.
SA: DCL 483
Effective Spring 2006  Effective Fall 2016

LAW 508F  Corporate Law & Policy: Corporate Governance & Compliance
Corporate Governance and Compliance
Spring of every year. 2 to 4 credits. 0 to 6 credits. R: Open to students in the MSU College of Law. R: Open to Law students or master of laws students or law lifelong students or law non-degree students in the MSU College of Law.
- A survey of issues in corporate governance & compliance in light of legal risks faced by corporations, directors, & officers.
SA: DCL 592b
Effective Spring 2006  Effective Fall 2016
LAW 517A  
**Mortgage Banking Law**
**Mortgage Finance**  
Spring of every year. Summer of every year. 2 to 4 credits, 0 to 6 credits. R: Open to students in the MSU College of Law. R: Open to Law students or master of laws students or law lifelong students or law non-degree students in the MSU College of Law. 
This course explores various legal issues in the mortgage-banking industry. The course will focus on residential property. Legal issues in the mortgage-banking industry with a focus on residential property. 
SA: DCL 466  
Effective Spring 2006 Effective Fall 2016

LAW 530A  
**Civil Procedure I**
**Civil Procedure**  
Fall of every year. Spring of every year. Summer of every year. 1 to 6 credits. R: Open to Law students or master’s of law students or law lifelong students or law non-degree students. R: Open to Law students or master of laws students or law lifelong students or law non-degree students. 
Survey of basic civil procedure, with primary emphasis on the Federal Rules of Civil Procedure and some discussion of state deviations from the federal model. 
SA: LAW 500A, LAW 500B  
Effective Fall 2011 Effective Summer 2016

LAW 592  
**Law Practice Management**  
Fall of every year. Spring of every year. 2 to 4 credits. 0 to 6 credits. P: LAW 500Q R: Open to students in the MSU College of Law. R: Open to Law students or master of laws students or law lifelong students or law non-degree students in the MSU College of Law. 
An overview of issues involved with managing a law office. 
SA: DCL 309  
Effective Spring 2006 Effective Summer 2016

LAW 594A  
**Contract Drafting**  
Fall of every year. 2 to 4 credits, 1 to 6 credits. P: LAW 500D and LAW 500N P: LAW 530B R: Open to students in the MSU College of Law. R: Open to Law students or master of laws students or law lifelong students or law non-degree students in the MSU College of Law. 
A study of common pitfalls in contract drafting & how to avoid them through proper drafting. 
SA: DCL 370  
Effective Spring 2006 Effective Summer 2016

LAW 629A  
**Journal of International Law**
**International Law Review**  
Fall of every year. Spring of every year. 0 to 6 credits. A student may earn a maximum of 6 credits in all enrollments for this course. P: LAW 500I and LAW 500K P: LAW 530D or LAW 530E or LAW 530N or LAW 530Q and LAW 530J R: Open to students in the MSU College of Law. R: Open to Law students or master of laws students or law lifelong students or law non-degree students in the MSU College of Law. 
A student may participate by entering the writing competition upon satisfactory completion by day students of two full semesters, or evening students of three full semesters. 
Request the use of the Pass-Fail Grade (P-F) system. 
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. 
SA: DCL 550  
Effective Spring 2006 Effective Summer 2016

LAW 804C  
**Advocacy for Foreign-Educated Lawyers**
**Communication Skills for Foreign-Educated Lawyers**  
Fall of every year. Spring of every year. Summer of every year. 0 to 6 credits. R: Open to master’s of law students. R: Open to master of laws students. 
Study and practice of the elements of oral advocacy, including critical analysis and the development of effective public speaking techniques. Study and practice of oral advocacy, including critical analysis and the development of effective public speaking techniques. 
Effective Fall 2011 Effective Fall 2016
DEPARTMENT OF LINGUISTICS AND GERMANIC, SLAVIC, ASIAN AND AFRICAN LANGUAGES

LL 250D  Topics in National Cinemas: Russian and Soviet Cinema
Spring of every year. 3(3-2)
  Development of Russian and Soviet cinematic styles and traditions in their historical and social context. Major films and directors. Introduction to film technique and analysis.
  Taught in English.
DELETE COURSE
Effective Fall 2016

LYMAN BRIGGS COLLEGE

LB 133  Introduction to History, Philosophy, and Sociology of Science
Fall of every year. Spring of every year. 4(4-0) P: Designated score on English Placement test R:
  Open to students in the Lyman Briggs College or in the Science, Technology, Environment and Public Policy Specialization. Not open to students with credit in AL 192 or AL 192H or RCAH 112 or WRA 110 or WRA 115 or WRA 125 or WRA 130 or WRA 135 or WRA 140 or WRA 145 or WRA 150 or WRA 195H. Not open to students with credit in RCAH 111 or WRA 101 or WRA 195H.
  Introduction to the history, philosophy, and sociology of science, technology, the environment, and medicine. Instruction and practice in formal writing.
SA: LBS 133
Effective Spring 2014 Effective Fall 2016

DEPARTMENT OF MATHEMATICS

MTH 291  Mathematics Snapshots
Spring of every year. 1(2-0) A student may earn a maximum of 2 credits in all enrollments for this course. P: MTH 132 or MTH 152H or LB 118 or approval of department RB: MTH 309 or MTH 314 or MTH 317H
  Selected topics in mathematics and its applications. Emphasis will be on important and intriguing ideas in mathematics without indulging in technical details.
DELETE COURSE
Effective Summer 2015

DEPARTMENT OF MEDICINE

MED 492  Basics and Methods in Biomedical Research
Fall of every year. Spring of every year. 2(2-0) 2 to 4 credits. P: (((BS 161 or BS 181H) and (BS 171 or BS 191H)) or LB 145) and ((MTH 103 or MTH 110 or MTH 116) or designated score on Mathematics Placement test) and (CEM 252 or CEM 352) R: Open to sophomores or juniors or seniors or approval of department. R: Approval of department
  Introduction to research concepts, strategies, methods and laboratory techniques in biomedical research. Laboratory safety, regulations, quality control and quality assurance. Online presentations and hands-on experience.
Request the use of the Pass-No Grade (P/N) system.
Effective Fall 2013 Effective Spring 2015
DEPARTMENT OF MICROBIOLOGY AND MOLECULAR GENETICS

MMG 141  Introductory Human Genetics
Fall of every year. Spring of every year. 3(3-0) R: Not open to students in the Biochemistry and Molecular Biology major or in the Biological Science Major or in the Clinical Laboratory Sciences Major or in the Human Biology Major or in the Microbiology Major or in the Physiology Major or in the Plant Biology Major or in the Zoology Major or in the Biomedical Laboratory Science Major or in the Environmental Biology/Microbiology Major or in the Environmental Biology/Plant Biology Major or in the Environmental Biology/Zoology Major or in the Genomics and Molecular Genetics Major or in the Neuroscience Major and not open to students in the Lyman Briggs Biochemistry and Molecular Biology Coordinate Major or in the Lyman Briggs Biological Science-Interdepartmental Coordinate Major or in the Lyman Briggs Biomedical Laboratory Science Coordinate Major or in the Lyman Briggs Environmental Biology/Plant Biology Coordinate Major or in the Lyman Briggs Environmental Biology/Zoology Coordinate Major or in the Lyman Briggs Human Biology Coordinate Major or in the Lyman Briggs Neuroscience Major or in the Lyman Briggs Microbiology Coordinate Major. R: Not open to students in the Biochemistry and Molecular Biology major or in the Biological Science Major or in the Biomedical Laboratory Science Major or in the Clinical Laboratory Sciences Major or in the Environmental Biology/Microbiology Major or in the Environmental Biology/Plant Biology Major or in the Environmental Biology/Zoology Major or in the Genomics and Molecular Genetics Major or in the Neuroscience Major or in the Physiology Major or in the Plant Biology Major or in the Zoology Major and not open to students in the Lyman Briggs Biochemistry and Molecular Biology Coordinate Major or in the Lyman Briggs Biological Science-Interdepartmental Coordinate Major or in the Lyman Briggs Biomedical Laboratory Science Coordinate Major or in the Lyman Briggs Environmental Biology/Plant Biology Coordinate Major or in the Lyman Briggs Environmental Biology/Zoology Coordinate Major or in the Lyman Briggs Human Biology Coordinate Major or in the Lyman Briggs Neuroscience Major or in the Lyman Briggs Microbiology Coordinate Major. Not open to students with credit in ZOL 341. Not open to students with credit in IBIO 341.
SA: ZOL 141
Effective Summer 2016 Effective Fall 2016

PROGRAM IN NEUROSCIENCE

NEU 301  Introduction to Neuroscience I
Fall of every year. 3(3-0) P: (BS 161 or BS 181H or LB 145) and (BS 162 or BS 191H or LB 144) P: (BS 161 or BS 181H or LB 145) and (BS 162 or BS 191H or LB 144) RB: PSY 101 R: Open to undergraduate students in the Program in Neuroscience.
Survey of the field of neuroscience, including molecular, cellular, and autonomic, sensory and motor systems.
Effective Fall 2014 Effective Fall 2016

NEU 310  Psychology and Biology of Human Sexuality
Spring of every year. 3(3-0) Interdepartmental with Psychology and Zoology, Interdepartmental with Integrative Biology and Psychology P: (PSY 101 or concurrently) and ((BS 161 or concurrently) or (BS 162 or concurrently) or (BS 181H or concurrently) or (BS 182H or concurrently)) Not open to students with credit in HDFS 445.
Effective Fall 2014 Effective Fall 2016
NEU 430  Genomics of Brain Development, Learning, and Behavior
Summer of every year. 3(3-0) R: (ZOL 341) and (NEU 302 or ZOL 402) P: (IBIO 341) and (NEU 302 or concurrently) RB: PSY 209
Role of genes in brain development and function. Issues in behavioral and psychiatric genetics.
Effective Summer 2015 Effective Fall 2016

COLLEGE OF NURSING

NUR 422  Nursing in London
Summer of every year. 6(6-0) R: Approval of college; application required.
Historical evolution of nursing in the National Health Service: British nursing education, hospital and community health nursing, standards of care, research, and management. Influence of professional nursing upon British national health policies. 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 Fall 2014 Effective Summer 2017

NUR 441  Future of Nursing: Graduate Education
Fall of every year. Spring of every year. 2(2-0) P: NUR 450 or concurrently R: Open to students in the Nursing Major.
Options for graduate education in nursing. Students will develop post-BSN professional goals. Identify potential clinical focus and population of interest for research/scholarship/practice. Completion of an application to the graduate program of their choice.
Effective Spring 2013 Effective Fall 2016

DEPARTMENT OF PATHOBIOLOGY AND DIAGNOSTIC INVESTIGATION

PDI 560  Introduction to Veterinary Cytology
Fall of every year. 1(0-2) 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.
Principles of sample collection, slide preparation, fluid analysis and interpretation using clinical case material. Request the use of the Pass-No Grade (P-N) system.
Effective Spring 2009 Effective Fall 2016

PDI 561  International Veterinary Medicine
Fall of every year. 1(1-0) 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.
Veterinary sciences and the needs of international countries. Request the use of the Pass-No Grade (P-N) system.
Effective Summer 2012 Effective Fall 2016

PDI 564  Topographic and Applied Anatomy of Live Horses and Cattle
Fall of every year. 1(0-2) 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.
Identification of structures and landmarks of clinical significance in live horses and cattle in relation to the structures imaged using endoscopy, ultrasonography, radiology, MRI, and CT scans. Request the use of the Pass-No Grade (P-N) system.
Effective Fall 2009 Effective Fall 2016
DEPARTMENT OF PHARMACOLOGY AND TOXICOLOGY

PHM 431  Pharmacology of Drug Addiction  
Fall of every year. 3(3-0) Interdepartmental with Neuroscience. RB: Zoology or Human Biology or Psychology or Biochemistry or Physiology.  
Introduction to pharmacology and neuropharmacology. Understanding of the biological basis for drug abuse and addiction.  
**Effective Spring 2014 Effective Summer 2016**

PHM 801  Fundamental Principles of Pharmacology and Toxicology  
Fall of every year. 1 to 2 credits. 3(3-0) R: Open to doctoral students or approval of department. R: Open to graduate students in the College of Natural Science or in the Department of Pharmacology and Toxicology or approval of department.  
Core principles of pharmacology and toxicology including pharmacokinetics, toxicokinetics (drug/toxicant absorption, distribution, metabolism, elimination, modeling), pharmacodynamics (drug-receptor and drug-enzyme interactions), and drug discovery.  
**Effective Fall 2013 Effective Fall 2016**

PHM 827  Physiology and Pharmacology of Excitable Cells  
Fall of every year. 4(4-0) Interdepartmental with Neuroscience and Physiology and Zoology. Interdepartmental with Integrative Biology and Neuroscience and Physiology. RB: PSL 431 or PSL 432 or BMB 401 or BMB 461 or ZOL 402 R: Open to graduate students in the College of Natural Science or in the Department of Pharmacology and Toxicology or approval of department.  
Function of neurons and muscle at the cellular level: membrane biophysics and potentials, synaptic transmission, sensory nervous system function.  
**Effective Fall 2001 Effective Fall 2016**

DEPARTMENT OF PHILOSOPHY

PHL 410  Socrates and Plato Seminar  
Fall of odd years. 4(4-0) A student may earn a maximum of 8 credits in all enrollments for this course. P: PHL 210 or approval of department RB: (PHL 210) or two other philosophy courses  
A selection of themes (ontology, epistemology, method, ethics) from Plato’s Socratic and constructive dialogues. Variable by term in content.  
**Effective Fall 2015 Effective Spring 2016**

PHL 411  Aristotle Seminar  
Spring of every year. 4(4-0) A student may earn a maximum of 8 credits in all enrollments for this course. P: PHL 210 or approval of department RB: (PHL 210) or two other philosophy courses  
Aristotle’s major works and his major contributions to the metaphysics, psychology, ethics, the arts, and politics. Variable by term in content.  
**Effective Fall 2015 Effective Spring 2016**

DEPARTMENT OF PLANT BIOLOGY

PLB 424  Algal Biology  
Fall of even years. Summer of odd years. 4(2-4) Interdepartmental with Zoology. Interdepartmental with Integrative Biology P: (BS 162 or LB 144 or BS 182H) and (BS 172 and completion of Tier I writing requirement) RB: ZOL 355 and ZOL 355L RB: IBIO 355 and IBIO 355L  
Algal taxonomy, systematics, physiology, ecology, and environmental assessment. Lab focus on identification of freshwater algal genera collected from regional habitats. SA: BOT 424  
**Effective Fall 2014 Effective Fall 2016**
FW 443  Restoration Ecology
Fall of odd years.  Spring of every year.  3(2-2)  Interdepartmental with Biosystems Engineering and Plant Biology and Zoology.  Interdepartmental with Biosystems Engineering and Fisheries and Wildlife and Integrative Biology.  P: FOR 404 or PLB 441 or ZOL 365  P: FOR 404 or PLB 441 or IBIO 355  RB: CSS 210 or BE 230
Principles of ecological restoration of disturbed or damaged ecosystems. Design, implementation, and presentation of restoration plans.  Field trips required.  Effective Fall 2014  Effective Fall 2017

PLB 443

PLB 849  Evolutionary Biology
Spring of every year.  3(3-0)  Interdepartmental with Zoology.  Interdepartmental with Integrative Biology  RB: ZOL 341 and (STT 422 or concurrently)  RB: IBIO 341 and (STT 422 or concurrently)
Major conceptual, theoretical and empirical questions in evolutionary biology. Readings and lectures are synthesized in student discussions and papers.  SA: BOT 849
Effective Fall 2002  Effective Fall 2016

PLB 898  Population and Community Ecology Theory Laboratory
Fall of every year.  1(0-3)  Interdepartmental with Zoology.  Interdepartmental with Integrative Biology  RB: 1 semester of calculus
Practical experience designing and analyzing mathematical models in ecology from single species to communities, food webs and ecosystems.  Effective Fall 2013  Effective Fall 2016

DEPARTMENT OF POLITICAL SCIENCE

PLS 481H  Undergraduate Research Seminar
PLS 481H  Honors Seminar in Research Design
Undergraduate Research Seminar
Fall of every year.  Spring of every year.  4(4-0)  P: PLS 200 or concurrently or approval of department  R: Approval of department.
Research design seminar for honor’s students in the political science program.  Advanced research seminar for students in the political science program.  Effective Fall 2014  Effective Fall 2016

DEPARTMENT OF PSYCHOLOGY

PSY 413  Laboratory in Behavioral Neuroscience (W)
Fall of every year.  4(2-4)  Interdepartmental with Zoology.  Interdepartmental with Integrative Biology  P: (PSY 209 or ZOL 402) and ((PSY 295 or STT 231) and completion of Tier I writing requirement)  P: (PSY 209 or IBIO 402) and ((PSY 295 or STT 231) and completion of Tier I writing requirement)
Theory and laboratory experience in the study of behavioral neuroscience.  Relationship among hormones, brain, and behavior.  SA: PSY 309
Effective Fall 2014  Effective Fall 2016

DEPARTMENT OF ROMANCE AND CLASSICAL STUDIES

ITL 330  Italian Culture and Civilization
Fall of every year.  Spring of every year.  Summer of every year.  3(3-0)  A student may earn a maximum of 6 credits in all enrollments for this course.  P: ITL 202
Diverse aspects of political, social, economic, intellectual, artistic, and literary life of Italy.  Class discussion in Italian of readings, films, television programs, and musical selections.  Effective Spring 2015  Effective Spring 2016

ITL 350  Introduction to Italian Literature
Fall of every year.  Spring of every year.  3(3-0)  P: ITL 320  P: (ITL 320) and completion of Tier I writing requirement
Italian literature from its origins to the present.  Reading and discussion in Italian of representative works from all genres.  Effective Spring 2015  Effective Spring 2016
ITL 360  Topics in the Italian Language and Culture  
Fall of even years. Spring of every year. Summer of every year. 3(3-0) A student may earn a maximum of 6 credits in all enrollments for this course. P: ITL 330  P: (ITL 320) and completion of Tier I writing requirement. 
Aspects of Italian culture or language as manifested in art, literature, music, and film.  
Effective Spring 2015 Effective Summer 2016

DEPARTMENT OF SMALL ANIMAL CLINICAL SCIENCES

SCS 563  Introduction to Exotic Species and Small Mammal Medicine  
Spring of every year. 1(1-0) RB: Completion of year 1 of the graduate-professional program in the College of Veterinary Medicine. R: Open to graduate-professional students in the College of Veterinary Medicine. 
Basic anatomy, physiology, and common disease processes of small mammals, birds, and reptiles. Species include ferrets, rabbits, guinea pigs, small rodents, pet birds, and reptiles.  
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 1 semester after the end of the semester of enrollment.  
Effective Spring 2009 Effective Spring 2016

SCS 564  Applied Small Animal Nutrition  
Fall of every year. 1(1-0) RB: Completion of year 1 of the graduate-professional program in the College of Veterinary Medicine. R: Open to graduate-professional students in the College of Veterinary Medicine. 
Principles of life stage nutrition and making dietary recommendations for healthy and sick small animal patients.  
Request the use of the Pass-No Grade (P-N) system.  
Effective Fall 2014 Effective Fall 2016

SCS 565  Animal Behavior  
Spring of every year. 1(1-0) RB: Completion of year 1 of the graduate-professional program in the College of Veterinary Medicine. R: Open to graduate-professional students in the College of Veterinary Medicine. 
Diagnosis, treatment and prevention of behavioral problems in dogs and cats. Topics include problem prevention, behavioral intervention, aggression, anxiety related problems, inappropriate elimination, normal unwanted behavior, client counseling and interaction, and companion animal welfare.  
Request the use of the Pass-No Grade (P-N) system.  
Effective Spring 2010 Effective Spring 2016

SCS 566  Emergency and Critical Care Medicine Seminars  
Fall of every year. Spring of every year. 1(1-0) RB: Completion of year 1 of the graduate profession program in the College of Veterinary Medicine. R: Open to graduate-professional students in the College of Veterinary Medicine. 
Case-based discussion of small animal veterinary emergency and critical care medical issues.  
Request the use of the Pass-No Grade (P-N) system.  
Effective Summer 2010 Effective Spring 2016

SCS 568  Small Animal Advanced Orthopedics Seminars  
Fall of every year. 1(1-0) 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. 
Basic biomechanics and research in orthopedics including novel concepts and techniques in fracture management, arthropathies, corrective osteotomies, implant design, and performance.  
Request the use of the Pass-No Grade (P-N) system.  
Effective Fall 2009 Effective Fall 2016
DEPARTMENT OF STATISTICS AND PROBABILITY

STT 465 Bayesian Statistical Methods
Fall of every year. 3(3-0) Interdepartmental with Epidemiology. P: STT 442
Probability, belief, and exchangeability. Objective, subjective, and empirical Bayes
approaches. Applications to one-parameter models, linear regression models, and
Effective Fall 2014 Effective Fall 2015

DEPARTMENT OF THEATRE

THR 111 Introduction to Technical Theatre
Fall of every year. Spring of every year. Summer of every year. 3(2-2) C: THR 111L concurrently.
Basic aspects of theatrical design and construction. Theory, process, equipment,
materials, skills and management.
Effective Fall 2015 Effective Fall 2016

THR 111L Introduction to Technical Theatre Laboratory
Fall of every year. Spring of every year. Summer of every year. 1(0-2) P: THR 111 or concurrently
C: THR 111 concurrently.
Intensive experience participating in the production program of the Department of Theatre.
Assisting at a beginning level with a scenery crew, costume crew, electrics crew,
properties crew or make-up crew.
Effective Fall 2015 Effective Fall 2016

THR 219 Introduction to Digital Design
Introduction to Projection Design for the Stage
Fall of even years. Spring of odd years. 3(2-2) P: THR 111 and THR 111L C: THR 219L concurrently.
Design and technical aspects regarding the design process and production of digital
performance media. Design and technical aspects regarding the design process and
production of projection performance media.
Effective Fall 2015 Effective Fall 2016

THR 219L Introduction to Digital Design Laboratory
Introduction to Projection Design for the Stage Laboratory
Fall of even years. Spring of odd years. 1(0-2) P: THR 111 and THR 111L C: THR 219 concurrently.
Participation in the production program of the Department of Theatre. Assisting at a
beginning level on the video production crew or as projection operator or run crew.
Effective Fall 2015 Effective Fall 2016

THR 416 Audio and Visual Technology
Stage Sound Design
Fall of every year. Spring of every year. 3(2-2) A student may earn a maximum of 6 credits in all
enrollments for this course. P: THR 211 and THR 211L P: THR 216 and THR 216L RB: THR 411
Development of theatrical audio and visual technology skills through hands-on application
and advanced study. Practical applications in audio workstations, computer programs and
hands-on techniques. Creating stage sound through script, acoustic, and performance-
space analysis. Practical application through composition and sound reinforcement for the
stage.
Effective Fall 2015 Effective Fall 2016
THR 419  Digital Design for Live Performance
Projection Design for Live Performance
Spring of every year. 3(2-2) Interdepartmental with Media and Information. A student may earn a maximum of 6 credits in all enrollments for this course. P: (THR 219 and THR 219L) or (THR 337 or MI 337 or MI 341) RB: THR 211 or THR 211L or THR 212 or THR 212L or THR 214 or THR 214L or THR 216 or THR 216L
Creating digital performance media through script, technology advancements, and production analysis. Practical application through digital rendering, video production and software exploration. Creating projection performance media through script, technology advancements, and production analysis. Practical application through digital rendering, video production and software exploration. Effective Summer 2016 Effective Fall 2016

COLLEGE OF VETERINARY MEDICINE

VM 250  Veterinary Comparative Clinical Physiology
Fall of every year. 5(4-0) 4(4-0) P: (Completion of Tier I Writing Requirement and (BS 161 and BS 171)) or LB 145 P: (Completion of Tier I Writing Requirement) and (BS 161 and BS 171)) or LB 145 R: Approval of college. C: VM 130 concurrently.

VM 811  Evolution and Ecology of Foodborne Pathogens
Fall of every year. Spring of every year. Summer of every year. 3 credits. R: Open to master's students in the Food Safety major or approval of college.
Evolution of foodborne pathogens. Ecology of microbial organisms found in the food chain from introduction through human consumption. 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 Fall 2012 Effective Spring 2016

VM 824  Global Food Safety
Fall of every year. Spring of every year. 3(3-0) RB: Professional or graduate status with knowledge of food safety. R: Open to graduate students in the Food Safety major or approval of college.
Understanding food safety challenges in different geographic regions. Development of interventions for food safety in a global context. Request the use of ET-Extension to postpone grading. The work for the course must be completed and the final grade reported within 3 semesters after the end of the semester of enrollment. Effective Spring 2014 Effective Spring 2016

VM 828  Food Safety Seminar Series
Fall of every year. Spring of every year. 1(1-0) Interdepartmental with Agriculture and Natural Resources and Natural Science and Social Science. RB: Enrollment in graduate program in related discipline
Selected current topics covering the broad areas of food safety as they relate to production, processing, transport, microbiology, toxicology, and social and human dimensions. DELETE COURSE Effective Spring 2016

VM 832  Food Safety Disease Control
Summer of every year. 3(3-0) R: Open to graduate students in the Food Safety major or approval of college.
Applied approaches to food borne disease control using case studies. 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. DELETE COURSE Effective Summer 2016
VM 835  Food Safety for Produce

Spring of every year, Summer of every year. 3(3-0) R: Open to graduate students in the Food Safety Major or approval of department.

Overview of food safety requirements for the produce sector with a focus on Good Agriculture Practices (GAPS).

Effective Summer 2015 Effective Spring 2016