MICHIGAN STATE UNIVERSITY

Report of
THE UNIVERSITY COMMITTEE ON CURRICULUM
to the Faculty Senate
January 20, 2015

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: ¹

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: ¹

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

COLLEGE OF AGRICULTURE AND NATURAL RESOURCES

1. Establish a Minor in Technology Systems Management in the Department of Biosystems and Agricultural Engineering. The University Committee on Undergraduate Education (UCUE) recommended approval of this request at its October 2, 2014 meeting.

a. Background Information:

The Minor in Technology Systems Management will provide students with an understanding of current and emerging technologies that support effective, efficient management decisions for agriculture and natural resources systems. The minor is a crosscutting program offering broader employability opportunities for students primarily in agriculture and natural resources. Students completing the minor gain an understanding on how biological and technology systems interface; how current and emerging technologies related to agriculture, food, natural resource and bioenergy systems; how technology’s role supports timely, efficient and effective management decisions; and how to communication technology nomenclature, function and operation to various and diverse audiences. The minor will fill the niche left by the discontinuation of the technology systems management major.

b. Academic Programs Catalog Text:

The Minor in Technology Systems Management, which is administered by the Departments of Biosystems and Agricultural Engineering, serves students interested in technology for management decision support who are pursuing careers in agriculture and natural resources. The minor provides an opportunity to gain a working knowledge of technologies necessary to monitor and manage aspects of food, agriculture, and natural resource systems.

The minor is available as an elective to students who are enrolled in bachelor’s degree programs at Michigan State University. With the approval of the department and college that administers the student’s degree program, the courses that are used to satisfy the minor may also be used to satisfy the requirements for the bachelor’s degree.

Students who plan to complete the requirements for the minor should consult an undergraduate advisor in the Department of Biosystems and Agricultural Engineering to have their program of study approved in advance and in writing.

Requirements for the Minor in Technology Systems Management

Students must complete a minimum of 15 credits from the following:

<table>
<thead>
<tr>
<th>CREDITS</th>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>TSM 130</td>
<td>Energy Efficiency and Conservation in Agricultural Systems</td>
</tr>
<tr>
<td></td>
<td>TSM 222</td>
<td>Fundamentals of Automation and Controls</td>
</tr>
<tr>
<td></td>
<td>TSM 226</td>
<td>Renewable Energy Systems Management</td>
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<td>TSM 251</td>
<td>Information Technology in Agricultural Systems</td>
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<td></td>
<td>TSM 331</td>
<td>Water Management in Agriculture and Food Systems</td>
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<tr>
<td></td>
<td>TSM 343</td>
<td>Principles of Precision Agriculture</td>
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<td>3</td>
<td>ABM 222</td>
<td>Agribusiness and Food Industry Sales (W)</td>
</tr>
<tr>
<td>3</td>
<td>ANS 418</td>
<td>Comprehensive Nutrient Management Planning</td>
</tr>
<tr>
<td>3</td>
<td>CSS 424</td>
<td>Sustainable Agriculture and Food Systems: Integration and Synthesis</td>
</tr>
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</table>
2. Establish an Agricultural Technology Certificate in Fruit, Vegetable, and Organic Horticulture Management in the Institute of Agricultural Technology. The University Committee on Undergraduate Education (UCUE) recommended approval of this request at its October 2, 2014 meeting.

a. Background Information:

Michigan’s fruit and vegetable industry contributed $1.4 billion to the Michigan economy in 2012. There is a high demand for experienced individuals who have technical and practical knowledge in the fruit, vegetable, and organic food industries across the state, and the country. More people than ever are focusing on local agriculture, and seeking educational programs that encompass the production of horticultural food crops. The two-year certificate program focused on fruit, vegetable and organic horticulture management can satisfy the needs of both the students and the industries in need of educated, trained professionals.

Michigan State University is home to the oldest Horticulture program in the country, MSU’s horticulture graduates are highly sought after by industry leaders because of the excellent knowledge and hands-on experience. MSU’s programs are locally and internationally renowned. Through the long-standing horticulture research and teaching programs, relationships between industry and faculty have been strengthened. The results of decades of research conducted around the state have been shared with members of industry and have promoted communication, interaction, and loyalty to MSU. Because MSU is a leader in horticulture teaching and research, this program is a perfect fit to continue building strong relationships with Michigan’s horticultural industries.

b. Academic Programs Catalog Text:

The Fruit, Vegetable, and Organic Horticulture Management program provides students an opportunity to gain the necessary skills for a successful career in the multibillion dollar fruit and vegetable industries. The program combines classroom instruction and theory with practical experience gained through field laboratories and a professional internship. Graduates of the program work as owners, managers, buyers, or salespersons in a wide variety of horticultural food crop industries: fruit and vegetable plan production; farmers’ markets; organic farms and community-supported agriculture programs; urban gardening; irrigation design, installation, and management; public and/or private botanical gardens; and more.

Horticulture is a complex and diversified, yet fully integrated discipline that encompasses the biological, molecular, physical, management and marketing sciences and the arts to improve the production of nutritious, high-quality and safe food, advance the development and use of new specialty crops, enhance human health and well-being, and positively impact the natural and built environments.

Students may enroll in online courses, courses that are integrated with outreach and extension programs, and 5- or 10- week courses. They will have opportunities to be extensively involved in professional and social activities beyond the classroom including: working in research laboratories; assisting in field-based projects, assisting with food crop production; and becoming involved with the Student Organic Farm, and the Ecological Food and Farm Stewardship Club.

Requirements for Fruit, Vegetable, and Organic Horticulture Management

1. All of the following courses (23 credits):
   - AT 045 Agricultural Communications 2
   - AT 071 Technical Mathematics 2
PART I – NEW ACADEMIC PROGRAMS AND PROGRAM CHANGES

AT 293 Professional Internship in Agricultural Technology 3
CSS 110 Computer Applications in Agronomy 2
CSS 210 Fundamentals of Soil Science 3
ENT 111 Basics of Applied Entomology 2
HRT 109 Introduction to Applied Plant Science 2
HRT 206 Training and Pruning Plants 1
HRT 207 Horticulture Career Development 1
HRT 218 Irrigation Systems for Horticulture 3
PLP 105 Fundamentals of Applied Plant Pathology 2

Students who demonstrate proficiency through placement testing for AT 045 and AT 071 will take elective course work to substitute the credit in those courses.

2. A minimum of 15 credits from the following courses:
   ABM 100 Decision-making in the Agri-Food System 3
   ABM 222 Agribusiness and Food Industry Sales (W) 3
   AT 055 Agricultural Finance 3
   AT 291 Selected Topics in Agricultural Technology 2
   HRT 204 Plant Propagation 2
   HRT 205 Plant Mineral Nutrition 1
   HRT 221 Greenhouse Structures and Management 3
   HRT 242 Passive Solar Greenhouses for Protected Cultivation 1
   HRT 243 Organic Transplant Production 1
   HRT 251 Organic Farming Principles and Practices 3
   HRT 253 Compost Production and Use 1

   Students who choose AT 291 Selected Topics in Agricultural Technology must enroll in the section titled ‘Spanish – Horticulture Industries’.

3. Completion of 10 additional elective credits in the college as approved by the program coordinator in the Institute of Agricultural Technology.

Effective Summer 2015

3. Change the name of the Agricultural Technology Certificate in Landscape and Nursery to the Agricultural Technology Certificate in Landscape and Nursery Management in the Institute of Agricultural Technology.

Students admitted to the certificate prior to Summer 2015 will graduate with an Agricultural Technology Certificate in Landscape and Nursery.

Students admitted to the certificate Summer 2015 and forward will graduate with an Agricultural Technology Certificate in Landscape and Nursery Management.

4. Change the requirements for the Agricultural Technology Certificate in Landscape and Nursery Management in the Institute of Agricultural Technology.

   a. Under the heading Landscape and Nursery Management replace the entire entry with the following:

   The Landscape and Nursery Management program at Michigan State University provides students an opportunity to gain the necessary skills for a successful career in the multibillion dollar green industry. The program combines classroom instruction and theory with practical experience gained through field laboratories and a professional internship. Graduates of the program work as owners, managers, buyers, or salespersons in a wide variety of horticultural industries: landscape design, construction, and management; irrigation design, installation, and management; retail garden center management; herbaceous and woody plant production; urban tree management; and public and/or private botanical gardens.

   Horticulture is a complex and diversified, yet fully integrated discipline that encompasses the biological, molecular, physical, management and marketing sciences and the arts to improve the production of nutritious, high-quality and safe food, advances the development and use of new specialty crops, enhances human health and well-being, and positively impacts the natural and built environments.
Students will have opportunities to enroll in online courses integrated with outreach and extension programs, and 5- or 10-week module courses. Students are extensively involved in activities beyond the classroom such as working in research laboratories; assisting in field-based projects, landscape, greenhouse, garden, and nursery operations; running the Horticulture Club’s annual spring show and plant sale; and participating in academic and field events associated with the Professional Landcare Network (PLANET).

The Landscape and Nursery Management program is offered by the Department of Horticulture in cooperation with the Institute of Agricultural Technology.

Requirements for the Landscape and Nursery Management

1. All of the following courses (30 credits):
   - AT 045 Agricultural Communications 2
   - AT 291 Selected Topics in Agricultural Technology 2
   - AT 293 Professional Internship in Agricultural Technology 3
   - CSS 110 Computer Applications in Agronomy 2
   - CSS 210 Fundamentals of Soil Science 3
   - ENT 111 Basics of Applied Entomology 2
   - HRT 109 Introduction to Applied Plant Science 2
   - HRT 207 Horticulture Career Development 1
   - HRT 211 Landscape Plants I 3
   - HRT 212 Landscape Plants II 3
   - HRT 213 Landscape Maintenance 2
   - HRT 213L Landscape Maintenance Field Laboratory 1
   - HRT 214 Landscape and Turfgrass Business Operations 2
   - PLP 105 Fundamentals of Applied Plant Pathology 2

   Students should enroll in the Turf and Landscape Calculations section of AT 291.

2. Complete at least 9 credits from the following courses:
   - AE 053 Engine and Equipment Maintenance 2
   - AT 291 Selected Topics in Agricultural Technology 2
   - CSS 181 Pesticide and Fertilizer Application Technology 3
   - CSS 202 World of Turf 2
   - CSS 202L World of Turf Lab 1
   - HRT 204 Plant Propagation 2
   - HRT 218 Irrigation Systems for Horticulture 3
   - HRT 219 Landscape Computer Aided Design 2
   - HRT 221 Greenhouse Structures and Management 3

   Students should enroll in the Spanish-Horticulture Industries section of AT 291.

3. Complete a minimum of 9 additional Agricultural Technology courses chosen in consultation with and approved by the program coordinator.

Effective Summer 2015.

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**COLLEGE OF ARTS AND LETTERS**

1. Establish a **Minor** in **Korean** in the Department of Linguistics and Germanic, Slavic, Asian and African Languages. The University Committee on Undergraduate Education (UCUE) recommended approval of this request at its September 18, 2014 meeting.

   a. **Background Information:**

   Korean language courses have been an integral part of the Asian studies curriculum in the Department of Linguistics and Germanic, Slavic, Asian and African Languages at MSU for over a decade. These courses were first regularized with an assistant professor of Korean was hired in 2007 as the first full-time instructor to coordinate and develop the Korean Language Program (KLP). Under this leadership, the KLP has now developed into a full program offering at all levels of instruction. Overall enrollments in Korean language courses have increased every year since and
the KLP is by far the largest program within the less commonly taught languages at MSU and is expected to grow steadily in the future given the robust interest in Korean language and culture.

Currently, the only Korea-related credential students can earn at MSU is the Asian Studies specialization with a Korean focus. Peer institutions have long-standing established programs. It is time for MSU to formalize the Korean language program which now has two committed faculty members in the department together with a number of faculty members across campus who teach courses with Korea-related content. The proposed minor will enable students to further enrich their educational experience. The new minor will demonstrate MSU’s growing strength in Asian Studies, providing a synergy which will have a positive impact on MSU’s increased focus on China and Chinese studies, our historical strength in Japanese studies, and our growing interest in Taiwan studies. The establishment of the minor will strengthen the existent linkages between MSU and external supporters.

b. Academic Programs Catalog Text:

The Minor in Korean, which is administered by the Department of Linguistics and Germanic, Slavic, Asian and African Languages, equips students with linguistic proficiency in the Korean language and cultural literacy about Korea and its place in the world. Students gain global cultural understanding, develop communication skills, and think analytically. Students are strongly encouraged to participate in study abroad programs, internships, student-centered organizations, and experiential learning opportunities through which they can practice the language and deepen their cultural understanding.

The minor is available as an elective to students who are enrolled in bachelor’s degree programs at Michigan State University. With the approval of the department and college that administers the student’s degree program, the courses that are used to satisfy the minor may also be used to satisfy the requirements for the bachelor’s degree.

Students who plan to complete the requirements for the minor should consult an undergraduate advisor in the department.

Requirements for the Minor in Korean

Students must complete a minimum of 17 credits from the following:

1. All of the following courses (11 credits):
   - LL 251 Second-Year Less Commonly Taught Language I 4
   - LL 252 Second-Year Less Commonly Taught Language II 4
   - LL 301 Third-Year Less Commonly Taught Language I 3

2. Two of the following courses (6 credits):
   - ASN 291 Special Topics in Asian Languages 3
   - LL 302 Third-Year Less Commonly Taught Language II 3
   - LL 401 Fourth-Year Less Commonly Taught Language I 3
   - LL 402 Fourth-Year Less Commonly Taught Language II 3

Other courses that contain a substantive amount of Korean or Korea-related content may be used for this requirement with approval of the Korean minor advisor.

Effective Spring 2015.
2. Establish a **Master of Arts** degree in **Spanish as a Second or Bilingual Language** in the Department of Romance and Classical Studies. The University Committee on Graduate Studies (UCGS) recommended approval of this request at its September 8, 2014 meeting.

a. **Background Information:**

The new master's program focuses on the study of Spanish as second or bilingual language. It reflects changes in the profession, from general area applied linguistics, which has become dated, to the study of the psycholinguistic aspects of the acquisition of Spanish by second language learners and bilinguals, and to the study of the sociolinguistic aspects of Spanish when used in contact situations by bilinguals or second language learners. The central goal of this program is to meet the needs and goals of students who seek academic preparation to pursue advanced work in these fields. The program is related to programs in linguistics and in second language studies. It is unique in that it uses linguistic theory to understand the acquisition and use of Spanish.

The program will replace the existent Master of Arts degree in Applied Spanish Linguistics which has been in place since 2001 and will be discontinued.

Students will actively engage with scholarly work in the areas of Spanish second language acquisition, sociolinguistics, syntax, and historical linguistics through reading, writing, and discussion. Students are able to apply foundational knowledge of phonology, syntax, and semantics to the formulation, analysis, and evaluation of research questions in Spanish second language studies and Spanish language variation and change. Learning about cross-cultural linguistic behavior as they study language acquisition and social patterns of language use will be beneficial for their cultural understanding that language is a formal system shared by all humans and that regional and social differences do not directly relate to a groups' abilities and potential. Communicating with undergraduate students in their courses, graduate students in their cohort, professors and administrators in service settings, and audiences at conferences is key as students learn to use oral and written discourse in Spanish and English to instruct, direct, and provide information.

b. **Academic Programs Catalog Text:**

The Master of Arts degree in Spanish as a Second or Bilingual Language provides the foundation and academic preparation to pursue advanced work in Spanish linguistics and further develop fluency in the Spanish language. Students will actively engage with scholarly work in the area of Spanish second language acquisition, sociolinguistics, syntax, and historical linguistics through reading, writing, and discussion. Students gain a cultural understanding and behavior as they study language acquisition and social patterns of language use.

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

**Admission**

To be admitted to the Master of Arts degree in Spanish as a Second or Bilingual Language, an applicant must have:

1. A bachelor's degree in Spanish or in Linguistics or a bachelor's-equivalent degree in Spanish philology (international students) with course work in Spanish at the 400-level.
2. Completed Linguistics 401 or its equivalent. This may be completed during the first semester of the master's program, if admitted. This course will not count towards the credit requirements for the degree.
Requirements for the Master of Arts Degree in Spanish as a Second or Bilingual Language

The Master of Arts degree in Spanish as a Second or Bilingual Language is available under Plan A (with thesis) or Plan B (non-thesis). A total of 30 credits is required for the degree. The student’s program of study must be approved by the graduate advisor. The student must complete the requirements specified below.

CREDITS

Requirements for Both Plan A and Plan B
1. Complete 9 credits from the following foundational courses.
   At least one must focus on Spanish.
   - LIN 424 Introduction to Phonetics and Phonology 3
   - LIN 431 Introduction to Morphology 3
   - LIN 434 Introduction to Syntax 3
   - LIN 437 Semantics and Pragmatics 3
   - LIN 824 Phonological Theory I 3
   - LIN 834 Syntactic Theory I 3
   - SPN 801 Spanish Syntax 3
2. Complete 6 credits in Second Language Acquisition. At least one course must focus on Spanish.
   - LLT 860 Second Language Acquisition 3
   - LLT 863 Second Language Acquisition of Morphosyntax 3
   - SPN 804 Spanish as a Second Language: Linguistic and Psycholinguistic Perspectives 3
   - SPN 806 Topics in Hispanic Linguistics 3
   Students who enroll in SPN 806 must select a course section that specifically deals with second language acquisition.
3. Complete 6 credits in Sociolinguistics and Bilingualism. At least one course must focus on Spanish.
   - LIN 471 Sociolinguistics 3
   - LIN 871 Advanced Studies of Sociolinguistics 3
   - SPN 803 Language Variation and Change in Spanish 3
   - SPN 806 Topics in Hispanic Linguistics 3
   Students who enroll in SPN 806 must select a course section that specifically deals with sociolinguistics and bilingualism.
4. Complete up to 9 credits of elective courses from the following:
   - LLT 841 Topics in Second/Foreign Language Learning and Teaching 3
   - ROM 803 Foundations of Contemporary Language Teaching 3
   - SPN 805 Evolution of the Spanish Language 3
   - SPN 890 Independent Study 1 to 3
   Student may also use courses from items 1., 2., and 3. above that were not used in fulfillment of those requirements. Students pursuing Plan A may use the 6 credits of master’s thesis research to fulfill this elective requirement.

Additional Requirements for Plan A
2. Pass a final oral examination in defense of the thesis.

Additional Requirements for Plan B
1. Pass a final certifying examination based on course work and the departmental reading list for the Master of Arts in Spanish as a Second or Bilingual Language.

Effective Fall 2015
3. Delete the curriculum and degree requirements for the Minor in American Studies in the Department of Writing, Rhetoric and American Cultures. The University Committee on Undergraduate Education (UCUE) provided consultative commentary to the Provost after considering this request at its September 18, 2014 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 2008. No students are to be readmitted to the program effective Fall 2008. Effective Fall 2014, coding for the program will be discontinued and the program will no longer be available in the Department of Writing, Rhetoric and American Cultures. Students who have not met the requirements for the Minor in American Studies through the Department of Writing, Rhetoric and American Cultures prior to Fall 2014 will have to change their major.

ELI BROAD COLLEGE OF BUSINESS

1. Change the name and award type of the Specialization in Entrepreneurship to Minor in Entrepreneurship and Innovation in the Eli Broad College of Business.

Per the May 30, 2013 memo to Deans, Directors, and Chairpersons from Linda O. Stanford, Associate Provost for Academic Services, all units offering undergraduate specializations will need to convert the award to a minor.

Students currently enrolled in the Specialization will continue to follow the requirements for the specialization that were in effect the term they were admitted to the specialization.

Students who do not complete the requirements for the specialization prior to Fall 2015 will be administratively moved to the minor.

Students admitted to the Minor in Entrepreneurship and Innovation Fall 2015 and forward will follow the requirements for the minor in accordance with the minor policy.

Effective Fall 2015.

2. Change the requirements for the Minor in Entrepreneurship and Innovation in the Eli Broad College of Business.

a. Under the heading Minor in Entrepreneurship and Innovation replace the entire entry with the following:

Students must maintain a 2.0 grade-point average in courses completed for the minor and complete 15 credits from the following:

1. Complete both of the following courses (6 credits):
   BUS 190 The Art of Starting 3
   MGT 352 Entrepreneurship: New Venture Process 3
   Or
   MKT 380 Entrepreneurship: Planning, Modeling and Adaptive Execution 3

2. Complete 9 credits from the following courses:
   ACC 333 Taxation and Accounting for the Entrepreneur 3
   FI 444 Entrepreneurial Finance 3
   GBL 467 Emerging Enterprise Law 3
   MGT 454 Technology Entrepreneurship 3
   MKT 355 Entrepreneurship: Strategic Marketing Planning and Launch 3
   MKT 420 New Product Design and Development 3
   MKT 480 Entrepreneurship Capstone Experience 3
   MKT 485 Entrepreneurship Practicum 1

Effective Fall 2015.
PART I – NEW ACADEMIC PROGRAMS AND PROGRAM CHANGES

COLLEGE OF EDUCATION

1. Change the requirements for the Doctor of Philosophy degree in K-12 Educational Administration in the Department of Educational Administration. The University Committee on Graduate Studies (UCGS) approved this request at its November 10, 2014 meeting.

   a. Under the heading Requirements for the Doctor of Philosophy Degree in K-12 Educational Administration make the following change:

      (1) Add the following item 4.:

      Successful completion and defense of the dissertation. Students may not earn more than 30 credits in EAD 999 Doctoral Dissertation Research.

   Effective Summer 2015.

COLLEGE OF ENGINEERING

1. Change the requirements in the Master of Science degree in Chemical Engineering in the Department of Chemical Engineering and Materials Science. The University Committee on Graduate Studies (UCGS) approved this request at its November 10, 2014 meeting.

   a. Under the heading Requirements for the Master of Science Degree in Chemical Engineering replace the entire entry with the following:

   The students must complete a total of 30 credits for the degree under Plan A (with thesis) or Plan B (without thesis), and meet the requirements specified below. Students in Plan A must complete a minimum of 20 credits at the 800-level or above. Students in Plan B must complete a minimum of 18 credits at the 800-level or above. Courses at the 400-level are acceptable as long as the minimum credit requirement is met at the 800-level. Courses below the 400-level are not acceptable.

   Requirements for Both Plan A and Plan B:

   1. Core Courses. All of the following courses (15 credits):
      
      CHE 801 Advanced Chemical Engineering Calculations  3
      CHE 802 Research Methods     3
      CHE 821 Advanced Chemical Engineering Thermodynamics  3
      CHE 822 Advanced Transport Phenomena 3
      CHE 831 Advanced Chemical Reaction Engineering 3

   2. Supporting Courses. Six credits in courses outside the Department of Chemical Engineering and Materials Science approved by the student’s academic advisor.

   Additional Requirements for Plan A

   1. Complete 6 credits of CHE 899 Master’s Thesis Research
   2. Additional elective credits as approved by the student’s academic advisor.

   Additional Requirements for Plan B

   1. Complete 6 to 9 credits in a coordinated technical minor as approved by the student’s academic advisor.
   2. Pass a final examination, oral or written, given by the student’s academic advisor.

   Effective Summer 2015.
2. Change the requirements in the Doctor of Philosophy degree in Chemical Engineering in the Department of Chemical Engineering and Materials Science. The University Committee on Graduate Studies (UCGS) approved this request at its November 10, 2014 meeting.

a. Under the heading Admission in paragraph two, remove the word ‘International’.

b. Under the heading Requirements for the Doctor of Philosophy Degree in Chemical Engineering replace the entire entry with the following:

In addition to meeting the requirements of the university and of the College of Engineering, students must meet the requirements specified by their guidance committee.

The Doctor of Philosophy degree in Chemical Engineering, as detailed in the graduate handbook for chemical engineering, is comprised of course work, research and selection of an advisor, a qualifying examination, formation of a guidance committee and doctoral degree program, a comprehensive examination, and successful completion of a dissertation and final oral examination in defense of the dissertation.

Effective Summer 2015.

3. Change the requirements in the Master of Science degree in Materials Science and Engineering in the Department of Chemical Engineering and Materials Science. The University Committee on Graduate Studies (UCGS) approved this request at its November 10, 2014 meeting.

a. Under the heading Admission delete paragraph two.

b. Under the heading Requirements for the Master of Science Degree in Materials Science and Engineering replace the entire entry with the following:

The students must complete a total of 30 credits for the degree under Plan A (with thesis) or Plan B (without thesis), and meet the requirements specified below. Students must complete a minimum of 18 credits at the 800-level or above.

Requirements for Both Plan A and Plan B:

<table>
<thead>
<tr>
<th>Core Courses. All of the following courses (12 credits):</th>
<th>CREDITS</th>
</tr>
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<tbody>
<tr>
<td>MSE 851 Thermodynamics of Solids</td>
<td>3</td>
</tr>
<tr>
<td>MSE 855 Advanced Rate Theory and Diffusion</td>
<td>3</td>
</tr>
<tr>
<td>MSE 860 Advanced Theory of Solids</td>
<td>3</td>
</tr>
<tr>
<td>MSE 870 Electron Microscopy in Materials Science</td>
<td>3</td>
</tr>
<tr>
<td>Or</td>
<td></td>
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<tr>
<td>MSE 881 Advanced Spectroscopy and Diffraction Analysis of Materials</td>
<td>3</td>
</tr>
</tbody>
</table>

Additional Requirements for Plan A

1. Complete the following course:

   CHE 802 Research Methods

2. Complete 6 credits of MSE 899 Master’s Thesis Research

3. One course at the 400-level or above in mathematics or statistics as approved by the student’s academic advisor.

4. Additional elective credits as approved by the student’s academic advisor.

Additional Requirements for Plan B

1. One course at the 400-level or above in mathematics or statistics as approved by the student’s academic advisor.

2. Additional elective credits as approved by the student’s academic advisor.

3. Pass a final examination, oral or written, given by the student’s academic advisor.

Effective Summer 2015.
PART I – NEW ACADEMIC PROGRAMS AND PROGRAM CHANGES

4. Change the requirements in the Doctor of Philosophy degree in Materials Science and Engineering in the Department of Chemical Engineering and Materials Science. The University Committee on Graduate Studies (UCGS) approved this request at its November 10, 2014 meeting.

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

   An applicant for admission to the Ph.D. degree program in materials science and engineering must hold a bachelor’s or master’s degree in materials science and engineering or a related field and must have a grade-point average that would indicate success in graduate study. Applicants must submit their scores on the Graduate Record Examination General Test.

   b. Under the heading Requirements for the Doctor of Philosophy Degree in Materials Science and Engineering replace the entire entry with the following:

   In addition to meeting the requirements of the university and of the College of Engineering, students must meet the requirements specified by their guidance committee.

   The Doctor of Philosophy degree in Materials Science and Engineering, as detailed in the graduate handbook for materials science and engineering, is comprised of course work, research and selection of an advisor, a qualifying examination, formation of a guidance committee and doctoral degree program, a comprehensive examination, and successful completion of a dissertation and final oral examination in defense of the dissertation.

   Effective Summer 2015.

COLLEGE OF NATURAL SCIENCE

1. Change the requirements for the Bachelor of Science degree in Biochemistry and Molecular Biology in the Department of Biochemistry and Molecular Biology.

   a. Under the heading Requirements for the Bachelor of Science Degree in Biochemistry and Molecular Biology make the following changes:

      (1) In item 3. a. (4) change the total credits from ’2 or 4’ to ’2’.

      (2) In item 3. a. (4) (b) delete the following course:

      CEM 186H Honors Chemistry Laboratory II 2

      Add the following course:

      CEM 185H Honors Chemistry Laboratory I 2

      (3) In item 3. a. (4) add the following note:

      Students who select CEM 185H may use that course alone to fulfill this requirement.

   Effective Summer 2015.
2. Change the requirements for the Bachelor of Science degree in Biochemistry and Molecular Biology/Biotechnology in the Department of Biochemistry and Molecular Biology.

- Under the heading Requirements for the Bachelor of Science Degree in Biochemistry and Molecular Biology/Biotechnology make the following changes:
  
  (1) In item 3. a. (4) change the total credits from '2 or 4' to '2'.
  
  (2) In item 3. a. (4) (b) delete the following course:
      
      CEM 186H Honors Chemistry Laboratory II    2
      
      Add the following course:
      
      CEM 185H Honors Chemistry Laboratory I    2
  
  (3) In item 3. a. (4) add the following note:
      
      Students who select CEM 185H may use that course alone to fulfill this requirement.

Effective Summer 2015.

3. Change the requirements for the Bachelor of Arts degree in Chemistry in the Department of Chemistry. The Teacher Education Council (TEC) approved this request at its November 3, 2014 meeting.

- Under the heading Requirements for the Bachelor of Arts Degree in Chemistry make the following changes:
  
  (1) In item 1., replace paragraph two with the following:
      
      The University’s Tier II writing requirement for the Chemistry major is met by completing Chemistry 333 and 425. Those courses are referenced in item 3. b. (5) below.
      
  (2) In item 3. a. make the following changes:
      
      (a) Change the total credits from '18 to 23' to '22 to 27'.
      
      (b) Add the following item (5):
          
          BMB 401 Comprehensive Biochemistry    4
  
  (3) In item 3. b. make the following changes:
      
      (a) Change the total credits from '32 to 34' to '36 or 37'.
      
      (b) In item (2) change the total credits from '4 or 5' to '5'.
      
      (c) In item (2) (b) delete the following course:
          
          CEM 186H Honors Chemistry Laboratory II    2
          
          Add the following course:
          
          CEM 262 Quantitative Analysis    3
PART I – NEW ACADEMIC PROGRAMS AND PROGRAM CHANGES

(d) In item (5) change the total credits from ‘10’ to ‘13’ and add the following course:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEM 425</td>
<td>Chemistry Communication and Professional Development (W)</td>
<td>3</td>
</tr>
</tbody>
</table>

Effective Summer 2015.

4. Change the requirements for the Bachelor of Science degree in Chemistry in the Department of Chemistry. The Teacher Education Council (TEC) approved this request at its November 3, 2014 meeting.

a. Under the heading Requirements for the Bachelor of Science Degree in Chemistry make the following changes in item 3. b:

   (1) In item b. change the total credits from ‘44 to 46’ to ‘45 or 46’.

   (2) In item (2) (b) delete the following course:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEM 186H</td>
<td>Honors Chemistry Laboratory II</td>
<td>2</td>
</tr>
</tbody>
</table>

   Add the following course:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEM 262</td>
<td>Quantitative Analysis</td>
<td>3</td>
</tr>
</tbody>
</table>

Effective Summer 2015.

5. Change the requirements for the Bachelor of Science degree in Chemical Physics in the Department of Chemistry.

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

   (1) In item 3. b. make the following changes:

   (a) Change the total credits from ‘27 to 30’ to ‘28 to 30’.

   (b) In item (2) change the total credits from ‘4 or 5’ to ‘5’.

   (c) In item (2) (b) delete the following course:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEM 186H</td>
<td>Honors Chemistry Laboratory II</td>
<td>2</td>
</tr>
</tbody>
</table>

   Add the following course:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEM 262</td>
<td>Quantitative Analysis</td>
<td>3</td>
</tr>
</tbody>
</table>

Effective Summer 2015.
6. Change the award type of the **Specialization in Actuarial Science** to **Minor in Actuarial Science** in the Department of Mathematics.

*Per the May 30, 2013 memo to Deans, Directors, and Chairpersons from Linda O. Stanford, Associate Provost for Academic Services, all units offering undergraduate specializations will need to convert the award to a minor.*

Students currently enrolled in the Specialization will continue to follow the requirements for the specialization that were in effect the term they were admitted to the specialization.

Students who do not complete the requirements for the specialization prior to Fall 2015 will be administratively moved to the minor.

Students admitted to the Minor in Actuarial Science Fall 2015 and forward will follow the requirements for the minor in accordance with the minor policy.

Effective Fall 2015.

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**COLLEGE OF SOCIAL SCIENCE**

1. Change the name of the **Doctor of Philosophy** degree in **Industrial Relations and Human Resources** to **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 November 10, 2014 meeting.

Students admitted to the major prior to Fall 2015 will graduate with a Doctor of Philosophy degree in Industrial Relations and Human Resources.

Students admitted to the major Fall 2015 and forward will graduate with a Doctor of Philosophy degree in Human Resources and Labor Relations.

2. Change the requirements for the **Doctor of Philosophy** 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 November 10, 2014 meeting.

   a. Under the heading **Requirements for the Doctor of Philosophy Degree in Human Resources and Labor Relations** replace the entire entry with the following:

      Students will complete course work and seminars within the School of Human Resources and Labor Relations and within other departments in the university. Students will be required to pass comprehensive examinations based on their course work, to demonstrate research competency by writing an empirical research paper, and to defend their dissertation successfully.

      Students must:

      1. Complete the following courses (15 credits):
         - HRLR 991A Theoretical Perspectives in Human Resource Management 3
         - HRLR 991B Theoretical Perspectives in Labor and Employment Relations 3
         - HRLR 992A Research Perspectives in Human Resource Management 3
         - HRLR 992B Research Perspectives in Labor and Employment Relations 3
         - HRLR 993 Research Methods for Human Resources and Labor Relations 3
      2. Complete three doctoral level research methods courses within other departments approved by the student’s doctoral committee.
      3. Complete four doctoral level courses in other departments approved by the student’s doctoral committee.

   Effective Fall 2015.
PART II - NEW COURSES

INSTITUTE OF AGRICULTURAL TECHNOLOGY

AT 202  Agricultural Regulation, Compliance and Safety
Fall of every year.  3(3-0) R: Open to agricultural technology students in the College of Agriculture and Natural Resources.
Regulation, laws, compliance and safety as it relates to Michigan’s agricultural sector. Michigan Occupational Safety and Health Administration safety standards, food safety, water protection, pesticide and fertilizer application and voluntary programs for agricultural producers. Preparation for the pesticide core exam.
Effective Spring 2015

BIOMEDICAL LABORATORY DIAGNOSTICS PROGRAM

BLD 214L  Biomedical Laboratory Research Techniques
Summer of every year.  2(1-3) P: MTH 103 or approval of department
Basic techniques, skills and safety in biomedical research. Ethical conduct of research and regulatory principles such as Good Laboratory Practice. Maintaining a research notebook for legal and intellectual property purposes. Offered second half of semester.
Effective Summer 2015

DEPARTMENT OF BIOSYSTEMS AND AGRICULTURAL ENGINEERING

TSM 130  Energy Efficiency and Conservation in Agricultural Systems
Spring of every year. Summer of every year. 3(3-0)
Introduction and basic concepts of energy efficiency and conservation in agricultural and food production systems.
Effective Fall 2015

TSM 222  Fundamentals of Automation and Controls
Fall of every year.  3(2-2) P: (TSM 121 or concurrently) or MTH 103 or approval of department
On-off controllers for electric actuators. Installation according to code. Ladder-logic. Programmable logic controllers. Installation and programming. Interfacing to a computer.
SA: AE 083, TSM 223
Effective Fall 2015

TSM 226  Renewable Energy Systems Management
Fall of every year. Summer of every year. 3(3-0) P: (TSM 121 or concurrently) or TSM 130 or MTH 103 or approval of department
Benefits and limitations (political, social, and environmental) of renewable energy power systems including biomass, solar photovoltaic, wind, geothermal, hydroelectric, and fuel cells.
Effective Fall 2015

TSM 331  Water Management in Agriculture and Food Systems
Spring of every year. 3(3-0) P: MTH 103
Principles of water management, use efficiency and conservation in agricultural production, natural resources and food processing facilities. Best agricultural water management practices, water rights, irrigation scheduling, irrigation systems selection, evaluation and management and drainage principles. Large scale water use, management and conservation in food processing.
SA: TSM 431
Effective Spring 2015
THE ELI BROAD COLLEGE OF BUSINESS

BUS 190  The Art of Starting
Spring of every year. 3(3-0) RB: Interest in entrepreneurship.
Aspects of the entrepreneurial experience. The entrepreneurial mindset and the venture creation process. Foundation for getting a venture started, and understanding of what it takes to be an entrepreneur.
Effective Spring 2015

DEPARTMENT OF CHEMISTRY

CEM 425  Chemistry Communication and Professional Development (W)
Fall of every year. 3(3-0) P: ((CEM 262) and completion of Tier I writing requirement) and (CEM 255 or CEM 355) R: Open to students in the Chemistry Major or approval of department.
Written and oral communication skills for entering and participating in the chemistry profession and post-undergraduate programs. Includes discussion of academic honesty and research integrity.
Effective Spring 2015

DEPARTMENT OF ENGLISH

ENG 325  Readings in Graphic Narrative
Spring of every year. 3(3-0) A student may earn a maximum of 6 credits in all enrollments for this course. P: {(ENG 126 or ENG 129 or ENG 140 or ENG 142 or ENG 153 or ENG 204 or ENG 205 or ENG 206 or ENG 218 or ENG 265) and (ENG 126 or ENG 129 or ENG 140 or ENG 142 or ENG 153 or ENG 204 or ENG 205 or ENG 206 or ENG 218 or ENG 265)} or ENG 210 RB: Six credits of literature R: Not open to freshmen.
Extensive Readings of graphic narratives across genres, historical periods, and/or print cultures and national traditions
Effective Spring 2015

ENG 340  Theory and Methods of Popular Culture Studies
Spring of every year. 3(3-0) A student may earn a maximum of 3 credits in all enrollments for this course. P: {(ENG 126 or ENG 129 or ENG 140 or ENG 142 or ENG 153 or ENG 204 or ENG 205 or ENG 206 or ENG 218 or ENG 265) and (ENG 126 or ENG 129 or ENG 140 or ENG 142 or ENG 153 or ENG 204 or ENG 205 or ENG 206 or ENG 218 or ENG 265)} or (ENG 210 or ENG 280 or (ENG 320A or concurrently) or (ENG 320B or concurrently) or (ENG 320C or concurrently)) RB: Six credits of literature R: Not open to freshmen.
Examination of the theories and methods of studies in popular culture.
Effective Spring 2015

ENG 440  Seminar in Popular Culture Studies
Fall of every year. 3(3-0) A student may earn a maximum of 6 credits in all enrollments for this course. P: ENG 340 and ENG 342 RB: Six credits of literature R: Not open to freshmen.
Advanced topics in theories and subjects of popular culture studies. Popular Culture’s intersection with theories of the other arts and media, politics, and identity.
Effective Spring 2015

SCHOOL OF HUMAN RESOURCES AND LABOR RELATIONS

HRLR 991A  Theoretical Perspectives in Human Resource Management
Fall of every year. 3(3-0) R: Open to graduate students in the School of Human Resources and Labor Relations or approval of school.
Theoretical perspectives and foundations for human resource management
Effective Fall 2014

HRLR 991B  Theoretical Perspectives in Labor and Employment Relations
Fall of every year. 3(3-0) A student may earn a maximum of 6 credits in all enrollments for this course. R: Open to graduate students in the School of Human Resources and Labor Relations or approval of school.
Theoretical perspectives and foundations for labor and employment relations.
Effective Fall 2014
PART II – NEW COURSES

HRLR 993  Research Methods for Human Resources and Labor Relations
Fall of every year. 3(3-0) R: Open to graduate students in the School of Human Resources and Labor Relations or approval of school.
Methods for empirical research in the areas of Human Resources and Labor and Employment Relations.
Effective Fall 2014

**MSU COLLEGE OF LAW**

LAW 541T  Immigration Consequences of Criminal Activity
Fall of every year. Spring of every year. 0 to 6 credits. P: LAW 541G R: Open to Law students or master of laws students or law lifelong students or law non-degree students.
Immigration consequences of criminal activity.
Effective Spring 2015

LAW 541U  Refugee and Asylum Law Seminar
Fall of every year. Spring of every year. 0 to 6 credits. R: Open to Law students or master of laws students or law lifelong students or law non-degree students.
Refugee and asylum law in the United States.
Effective Spring 2015

LAW 551C  Public Law Colloquium
Fall of every year. Spring of every year. 0 to 6 credits. P: LAW 500C and LAW 530G R: Open to Law students or master of laws students or law lifelong students or law non-degree students.
Current issues in constitutional, administrative and regulatory law.
Effective Spring 2015

LAW 565C  Legal Issues with Energy Development and Wildlife
Spring of every year. 0 to 6 credits. R: Open to Law students or master of laws students or law lifelong students or law non-degree students.
Emerging issues in energy law and policy relating to fish and wildlife.
Effective Spring 2015

LAW 600G  Problem Solving in Michigan Family Law
Spring of every year. 0 to 6 credits. R: Open to Law students or master of laws students or law lifelong students or law non-degree students.
Family law in statutory mandates and common law.
Effective Spring 2015

**DEPARTMENT OF MARKETING**

MKT 380  Entrepreneurship: Planning, Modeling, and Adaptive Execution
Fall of every year. Spring of every year. 3(3-0) P: BUS 190 R: Open to students in the Entrepreneurship and Innovation Minor.
Strategies for successful entrepreneurship, customer development process, risk mitigation procedures, new product development process, adaptive execution, engaging the marketplace.
Effective Fall 2015

MKT 485  Entrepreneurship Practicum
Spring of every year. 1(0-1) P: MGT 352 and BUS 190 R: Open to students in the Entrepreneurship and Innovation Minor.
Engagement in entrepreneurial activities outside the classroom; such as conferences, pitch competitions, idea or startup camps, unpaid internships, and other events that provide students with real world experience.
Effective Fall 2015
COLLEGE OF VETERINARY MEDICINE

VM 826 Creating a Food Safety Culture  
Summer of odd years. 3(3-0) RB: Professional or graduate status with knowledge of food safety. R: Open to graduate students in the Food Safety Major. Approval of college. 
Explores proven, evidence-based ways to change or strengthen the food safety culture of an organization and influence employee behavior. 
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 2015

VM 827 Food Safety Modernization Act and Hazard Analysis and Critical Control Point Systems  
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. Approval of college. 
Food safety requirements for food establishments subject to the Food Safety Modernization Act. Food safety management systems, with a focus on the Hazard Analysis and Critical Control Points (HACCP) Approach. 
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 2015
PART III – COURSE CHANGES
DEPARTMENT OF AGRICULTURAL, FOOD, AND RESOURCE ECONOMICS

AEC 845  Commodity Market Analysis
Fall of every year. 3(3-0) RB: AEC 835
DELETE COURSE
Effective Fall 2014

AEC 855  Agricultural Production Economics
Fall of every year. 3(3-0) RB: (EC 801 and EC 805) and (AEC 835 and EC 823)
Analysis of production models using econometrics, mathematical programming, and simulation. Systems science perspective.
DELETE COURSE
Effective Fall 2014

AEC 804  Mathematical Applications in Economics
AFRE 801  Mathematical Applications in Economics
Fall of every year. 3(3-0) RB: MTH 124 or MTH 132 R: Open to graduate students.
SA: EC 801 SA: AEC 801, EC 801
Effective Fall 2007 Effective Summer 2015

AEC 802  Statistical Methods for Agricultural, Food, and Resource Economists
AFRE 802  Statistical Methods for Agricultural, Food, and Resource Economists
Fall of every year. 3 credits. C: AEC 801 concurrently. C: AFRE 801 concurrently.
Applications of statistical tools for economic analysis.
SA: AEC 802
Effective Fall 2013 Effective Summer 2015

AEC 805  Microeconomic Analysis
AFRE 805  Microeconomic Analysis
Fall of every year. Spring of every year. 3(3-0) RB: AEC 801 or concurrently RB: AFRE 801 or concurrently R: Open to graduate students.
Microeconomic theory with calculus. Production, costs, demand, markets, general equilibrium, and welfare theory.
SA: EC 805 SA: EC 805, AEC 805
Effective Fall 2008 Effective Summer 2015

AEC 810  Institutional and Behavioral Economics
AFRE 810  Institutional and Behavioral Economics
Fall of every year. 3(3-0) Interdepartmental with Economics. RB: EC 301
Relationships among institutions, individual and collective actions, and economic performance. Public choice, property rights, and behavioral theories of firms and bureaucracies.
SA: AEC 810
Effective Fall 2010 Effective Summer 2015

AEC 817  Political Economy of Agricultural and Trade Policy
AFRE 817  Political Economy of Agricultural and Trade Policy
Spring of every year. 3(3-0) RB: (EC 805 or EC 812A) and (EC 809 or EC 813A) RB: AFRE 805 or EC 812A
SA: AEC 817
Effective Fall 1995 Effective Summer 2015
### Part III – Course Changes

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Description</th>
<th>Effective Dates</th>
</tr>
</thead>
<tbody>
<tr>
<td>AFRE 823</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>AEC 829</td>
<td>Economics of Environmental Resources</td>
<td>Spring of every year. 3(3-0) Interdepartmental with Community, Agriculture, Recreation and Resource Studies and Economics and Forestry and Fisheries and Wildlife. Interdepartmental with Community Sustainability and Economics and Forestry and Fisheries and Wildlife. RB: Undergraduate intermediate microeconomics, calculus, and statistics. Economic principles, theoretical models, and empirical methods related to environmental problems and policy interventions. Applications to air, land, water, forests, energy, fish and wildlife, and climate change, including in developing countries. SA: AEC 829. Effective Summer 2014. Effective Summer 2015.</td>
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<tr>
<td>AFRE 829</td>
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<tr>
<td>AEC 835</td>
<td>Introductory Econometrics</td>
<td>Spring of every year. 3(3-0) RB: STT 430. Estimation and interpretation of multiple regression models and their modifications when usual assumptions are not valid. Applications focus on problems faced by agricultural economists. SA: AEC 835. Effective Spring 1999. Effective Summer 2015.</td>
<td></td>
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<tr>
<td>AFRE 835</td>
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<tr>
<td>AEC 841</td>
<td>Analysis of Food System Organization and Performance</td>
<td>Spring of every year. 3(3-0) Industrial organization, subsector, and transaction cost approaches to analyzing coordination and performance of agricultural markets, contracting, and integration in the food systems of industrialized and developing countries. Applications to issues of organization, control, and public policy. SA: AEC 841. Effective Summer 1998. Effective Summer 2015.</td>
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<tr>
<td>AFRE 841</td>
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<tr>
<td>AFRE 851</td>
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<tr>
<td>AEC 853</td>
<td>Financial Management in Agriculture</td>
<td>Spring of every year. 3(3-0) Financial and investment analysis tools and concepts and their application to decisions faced by agricultural, agribusiness, and food industry firms. Financial institutions and instruments, credit programs, and financial sector performance in low-income and high-income countries. SA: AEC 853. Effective Summer 1998. Effective Summer 2015.</td>
<td></td>
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<tr>
<td>AFRE 853</td>
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</tbody>
</table>
PART III – COURSE CHANGES

AEC 857
AFRE 857 Strategic Management in Agribusiness
Fall of every year. 3(3-0)
Managerial problems faced by agribusiness firms. Strategies to interpret and respond to forces affecting the industry. Case study approach.
SA: AEC 891A SA: AEC 857, AEC 891A
Effective Fall 1998 Effective Summer 2015

AEC 861
AFRE 861 Agriculture in Economic Development
Fall of every year. 3(3-0)
SA: AEC 861
Effective Fall 1992 Effective Summer 2015

AEC 865
AFRE 865 Agricultural Benefit-Cost Analysis
Fall of every year. Spring of every year. 3(3-0)
Benefit-cost analysis of agricultural and natural resource projects, including financial and economic analysis. Case studies in project design and appraisal in low and high income countries.
SA: AEC 865
Effective Fall 1992 Effective Summer 2015

AEC 874
AFRE 874 Field Data Collection and Analysis in Developing Countries
Spring of every year. Summer of odd years. 3(3-0) RB: AEC 861 RB: AFRE 861
Designing and conducting socioeconomic surveys to inform agricultural production, marketing, and environment/natural resource issues in developed and developing countries. Research proposal preparation, questionnaire design, sampling, data collection, and data processing and analysis using computers.
SA: AEC 891C SA: AEC 874, AEC 891C
Effective Fall 1998 Effective Summer 2015

AEC 890
AFRE 890 Independent Study
Fall of every year. Spring of every year. Summer of every year. 1 to 3 credits. A student may earn a maximum of 8 credits in all enrollments for this course. R: Open only to graduate students in the Department of Agricultural Economics. Approval of department. R: Open to graduate students in the Department of Agricultural, Food, and Resource Economics. Approval of department.
Independent study of selected topics in agricultural economics. Independent study of selected topics in agricultural, food, and resource economics.
SA: AEC 890
Effective Fall 1992 Effective Summer 2015

AEC 891
AFRE 891 Topics in Agricultural Economics
Topics in Agricultural, Food, and Resource Economics
Fall of every year. Spring of every year. Summer of every year. 1 to 3 credits. A student may earn a maximum of 12 credits in all enrollments for this course.
Selected topics in analytical methods, agri-food systems economics and management, and agricultural and natural resource development and policy.
SA: AEC 891
Effective Summer 1998 Effective Summer 2015
PART III – COURSE CHANGES

AEC 898
AFRE 898 Master's Research
Fall of every year. Spring of every year. Summer of every year. 1 to 4 credits. A student may earn a maximum of 6 credits in all enrollments for this course. R: Open only to masters students in the Agricultural Economics major. Approval of department. R: Open to masters students in the Department of Agricultural, Food, and Resource Economics. Approval of department.
Master's degree Plan B research.
Request the use of the Pass-No Grade (P-N) system.
SA: AEC 898
Effective Summer 2001 Effective Summer 2015

AEC 899
AFRE 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 99 credits in all enrollments for this course. R: Open only to masters students in the Agricultural Economics major. Approval of department. R: Open to masters students in the Department of Agricultural, Food, and Resource Economics. Approval of department.
Master's thesis research.
Request the use of the Pass-No Grade (P-N) system.
SA: AEC 899
Effective Summer 2001 Effective Summer 2015

AEC 900A
AFRE 900A Applied Microeconomics I
Fall of every year. 3 credits. P: (AEC 805 or EC 812A) and (AEC 835 or EC 820A) P: (AFRE 805 or EC 812A) and (AFRE 835 or EC 820A)
Empirical analysis of microeconomic problems with emphasis on applications to agriculture, natural resources, and the food sector.
SA: AEC 900A
Effective Fall 2013 Effective Summer 2015

AEC 900B
AFRE 900B Applied Microeconomics II
Spring of every year. 3 credits. P: AEC 900A P: AFRE 900A
Extended empirical analysis of microeconomic problems with emphasis on applications to agriculture, natural resources, and the food sector.
SA: AEC 900B
Effective Fall 2013 Effective Summer 2015

AEC 923
AFRE 923 Advanced Environmental and Resource Economics
Fall of every year. 3(3-0) Interdepartmental with Economics and Forestry and Park, Recreation and Tourism Resources and Resource Development. Interdepartmental with Economics and Forestry
RB: AEC 929 and EC 812A RB: (AFRE 829 or concurrently) and EC 812A
Advanced economic theory of environmental management and policy. Treatment of externalities and market and non-market approaches to environmental improvement. Topics in conservation and sustainable economic growth. Applications to research and policy.
SA: AEC 923
Effective Fall 2004 Effective Summer 2015

AEC 925
AFRE 925 Advanced Natural Resource Economics
Spring of every year. 3(3-0) Interdepartmental with Economics and Forestry. Interdepartmental with Economics
RB: (EC 812A and EC 812A and AEC 839 and FOR 956) and (AEC 829 or FOR 956)
RB: EC 812A and AFRE 829
Economic theory of managing nonrenewable and renewable resources, including optimal use, the incentives for use under decentralized markets, and public policy design. Analysis of the co-evolution of economic and ecological systems.
SA: AEC 991H SA: AEC 991H, AEC 925
Effective Summer 2010 Effective Summer 2015
PART III – COURSE CHANGES

AEC 930  
AFRE 930  
Dynamic Analysis in Agriculture and Natural Resources  
Spring of every year. 3(3-0)  
RB: EC 801 and EC 812A  
RB: AFRE 801 and EC 812A  
R: Open only to Ph.D. students in the College of Agriculture and Natural Resources or College of Business or College of Social Science or approval of department.  
R: Open to doctoral students in the College of Agriculture and Natural Resources or in the Eli Broad College of Business and The Eli Broad Graduate School of Management or in the College of Social Science or approval of department.  
Methods of dynamic optimization and their application to agricultural and natural resources problems. Discrete time dynamic programming, calculus of variations, and discrete time maximum principle.  
SA: AEC 991E  
SA: AEC 991E, AEC 930  
Effective Summer 2000  
Effective Summer 2015

AEC 932  
AFRE 932  
Information Economics and Institutions in Agriculture and Natural Resources  
Fall of every year. 3(3-0)  
RB: (AEC 800 or AEC 810 or AEC 841) and (EC 812A and EC 812B)  
RB: (AFRE 810 or AFRE 841) and (EC 812A and EC 812B)  
R: Open only to Ph.D. students in the Colleges of Agriculture and Natural Resources or Business or Social Science.  
R: Open to doctoral students in the College of Agriculture and Natural Resources or in the Eli Broad College of Business and The Eli Broad Graduate School of Management or in the College of Social Science.  
Applications to issues in agriculture, agribusiness, the food system, natural resources, and the environment. Asymmetric information, incomplete markets, principal/agent issues, transaction costs, and the design of contracts and other institutions.  
SA: AEC 932  
Effective Spring 2001  
Effective Summer 2015

AEC 961  
AFRE 961  
Advanced Agricultural Development Economics  
Spring of every year. 3 credits.  
P: EC 812A and EC 812B and EC 820A and EC 820B  
RB: AEC 864  
RB: AFRE 861  
Theoretical and empirical models of microeconomics of international agricultural development, with emphasis on household and individual behaviors related to production, investment and marketing decisions.  
SA: AEC 961  
Effective Fall 2013  
Effective Summer 2015

AEC 991  
AFRE 991  
Advanced Topics in Agricultural Economics  
Advanced Topics in Agricultural, Food, and Resource Economics  
Fall of every year. Spring of every year. Summer of every year. 1 to 3 credits. A student may earn a maximum of 12 credits in all enrollments for this course.  
R: Open only to Ph.D. students in the colleges of Agriculture and Natural Resources, Business, and Social Science, or with department approval.  
R: Open to doctoral students in the College of Agriculture and Natural Resources or in the Eli Broad College of Business and The Eli Broad Graduate School of Management or in the College of Social Science.  
Advanced topics such as price analysis, finance, risk and modeling techniques, agri-food systems, environmental economics and management, and agricultural and natural resource development and policy.  
SA: AEC 991  
Effective Spring 1999  
Effective Summer 2015

AEC 999  
AFRE 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 Agricultural, Food, and Resource Economics or in the Agricultural, Food and Resource Economics Major. Approval of department.  
Doctoral dissertation research.  
Request the use of the Pass-No Grade (P-N) system.  
SA: AEC 999  
Effective Fall 2014  
Effective Summer 2015
DEPARTMENT OF BIOSYSTEMS AND AGRICULTURAL ENGINEERING

TSM 122  Alternating and Direct Current Machines
Spring of every year. 3(3-3) P: (TSM 121 or concurrently) or MTH 103 or approval of department
Types and characteristics of electric motors. Connecting, reversing and servicing of AC and DC motors and drives. Stepper motors. Variable frequency drives for induction motors. Offered first ten weeks of semester.
SA: AE 084
DELETE COURSE
Effective Fall 2015

TSM 223  Fundamentals of Automation and Controls
Fall of every year. 4(3-2) P: (TSM 121 or concurrently) or MTH 103 or approval of department
On-off controllers for electric actuators. Installation according to code. Ladder-logic.
Programmable logic controllers. Installation and programming. Interfacing to a computer.
SA: AE 083
DELETE COURSE
Effective Summer 2015

TSM 224  Fundamentals of Digital Systems
Spring of every year. 3(3-0) P: (TSM 121 or concurrently) or MTH 103 or approval of department
Not open to students with credit in ECE 230.
DELETE COURSE
Effective Fall 2015

TSM 341  Power and Machinery Systems
Fall of every year. 3(2-2) P: MTH 103 or approval of department
Principles, performance, operation, and management of agricultural machine systems and tractors.
DELETE COURSE
Effective Fall 2015

TSM 431  Irrigation, Drainage and Erosion Control
Fall of every year. 3(2-2) P: MTH 103 and CSS 210 or approval of department R: Not open to freshmen or sophomores.
Soil and water conservation engineering, including land and soil surveying, basic hydraulics, hydrology, soil moisture, and soil and water conservation practices.
Applications to irrigation, drainage, and erosion control systems.
DELETE COURSE
Effective Summer 2015

DEPARTMENT OF CHEMISTRY

CEM 186H  Honors Chemistry Laboratory II
Spring of every year. 2(0-6) P: CEM 182H or concurrently R: Approval of department.
Laboratory research.
DELETE COURSE
Effective Spring 2015

CEM 262  Quantitative Analysis
Fall of every year. Spring of every year. Summer of every year. 3(3-3) P: (CEM 142 or CEM 152 or CEM 182H or LB 172) and (CEM 162 or CEM 185H or LB 172L)
Not open to students with credit in CEM 186H.
Introduction to analytical chemistry and quantitative methods; aqueous solution equilibria and statistics related to quantitative chemical analysis; titrimetric, gravimetric, and spectrophotometric measurements.
Effective Fall 2013 Effective Summer 2015
CEM 333  Instrumental Methods and Applications  
Spring of every year. 3(2-3) P: (CEM 262 or CEM 186H) or (CEM 162 and BLD 213 and BLD 417) and ((CEM 143 or CEM 251 or CEM 351) and completion of Tier I writing requirement) P: (CEM 262 or CEM 162 and BLD 213 and BLD 417) and ((CEM 143 or CEM 251 or CEM 351) and completion of Tier I writing requirement)  
Principles and applications of instrumental analysis of separation techniques.  
Effective Spring 2013 Effective Spring 2015

CEM 355  Organic Laboratory I  
Spring of every year. 2(0-6) P: (CEM 162 or CEM 186H or LB 172L) and (((CEM 352 or concurrently) or (CEM 252 or concurrently)) and completion of Tier I writing requirement) P: (CEM 162 or CEM 185H or LB 172L) and (((CEM 352 or concurrently) or (CEM 252 or concurrently)) and completion of Tier I writing requirement)  
Effective Spring 2013 Effective Spring 2015

CEM 395  Analytical/Physical Laboratory  
Spring of every year. 2(1-4) P: (CEM 483 and completion of Tier I writing requirement) and (CEM 262 or CEM 186H) P: (CEM 483 and (CEM 484 or concurrently) and CEM 262) and completion of Tier I writing requirement C: CEM 484 concurrently.  
Chemical kinetics, thermodynamics, and computer-based data analysis methods.  
SA: CEM 372, CEM 472  
Effective Spring 2013 Effective Spring 2015

DEPARTMENT OF COUNSELING, EDUCATIONAL PSYCHOLOGY, AND SPECIAL EDUCATION

CEP 862  Introduction to Individual and Group Counseling  
Fall of every year. Spring of every year. 3(3-0) R: Open only to graduate students in the College of Education, College of Human Ecology, or School of Social Work.  R: Open to graduate students in the College of Education and open to graduate students in the School of Social Work and open to graduate students in the Department of Human Development and Family Studies.  
Forming, working with, and ending groups. Building relationships. Handling obstacles. Developing and carrying out agendas in counseling. Simulated individual and group practice.  
Effective Fall 1992 Effective Spring 2015

CEP 907  Psychological Study of Teaching  
Fall of odd years. Spring of every year. 3(3-0) Interdepartmental with Teacher Education. R: Open to doctoral students.  
Research literature on psychological aspects of teachers and teaching. Topics include teacher's decision-making, learning from experience, and developmental changes.  
Effective Fall 2006 Effective Spring 2015

CEP 973  Child Neuropsychological Assessment  
Spring of even years. Spring of every year. 3(3-0) P: CEP 880 and CEP 972 R: Open to graduate students.  
Best practice in neuropsychological assessment of children, including interviewing, assessment, hypothesis testing and feedback.  
Effective Spring 2011 Effective Spring 2015

DEPARTMENT OF ENGLISH

ENG 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 99 credits in all enrollments for this course. A student may earn a maximum of 36 credits in all enrollments for this course. R: Open only to doctoral students in the English major. R: Open to doctoral students in the College of Arts and Letters or in the Department of English or in the English Major.  
Doctoral dissertation research.  
Request the use of the Pass-No Grade (P-N) system.  
Effective Fall 1999 Effective Fall 2014
SCHOOL OF HUMAN RESOURCES AND LABOR RELATIONS

HRLR 992A  Seminar in Organizational Behavior and Human Resources
Research Perspectives in Human Resource Management
Fall of odd years. Spring of every year. 3(3-0) A student may earn a maximum of 6 credits in all enrollments for this course. RB: LIR 823 and LIR 824 RB: HRLR 991A R: Open to graduate students in the School of Human Resources and Labor Relations. Approval of school. R: Open to graduate students in the School of Human Resources and Labor Relations or approval of school. Research and policy analysis of selected topics in organizational behavior and human resources in labor and industrial relations. Research and policy analysis of selected topics in human resource management.
SA: LIR 992A
Effective Summer 2013 Effective Summer 2015

LIR 992B  Employment Relations Theory and Research
Research Perspectives in Labor and Employment Relations
Fall of odd years. Spring of every year. 3(3-0) A student may earn a maximum of 6 credits in all enrollments for this course. RB: LIR 801 and LIR 858 RB: HRLR 991B R: Open only to students in the School of Labor and Industrial Relations. R: Open to graduate students in the School of Human Resources and Labor Relations or approval of school. Research and policy analysis of selected topics in collective bargaining and labor unions. Research and policy analysis of selected topics in labor and employment relations.
SA: LIR 992B
Effective Summer 2005 Effective Summer 2015

DEPARTMENT OF MICROBIOLOGY AND MOLECULAR GENETICS

MMG 103  Frontiers of Microbiology and Molecular Genetics
Spring of every year. 1(2-0) R: Open to freshmen or sophomores. Current microbiology research. Significance to modern biological science and impact on society.
PCR Request the use of the Pass-No Grade (P-N) system.
Effective Spring 2009 Effective Spring 2015

MMG 201  Fundamentals of Microbiology
Spring of every year. 3(3-0) RB: CEM 141 or ISP 201 or ISP 207 or ISP 209 or ISP 217 RB: (CEM 141 or ISP 207 or ISP 209 or ISP 217 or LB 171) and (BS 161 or BS 181H or LB 145)
PCR Microbial structure, function, growth, control, and diversity. Role of microbes in health, industry, and the environment.
SA: MMG 105, MMG 205
Effective Spring 2005 Effective Spring 2014

MMG 301  Introductory Microbiology
Fall of every year. Spring of every year. 3(3-0) P: (BS 161 or LB 145 or BS 181H) and ((CEM 251 or concurrently) or (CEM 351 or concurrently) or (CEM 143 or concurrently))
PCR Fundamentals of microbiology, including microbial structure and function, nutrition and growth, death and control. Importance and applications of major microbial groups. SA: MIC 301
Effective Fall 2014 Effective Spring 2014

MMG 302  Introductory Laboratory for General and Allied Health Microbiology
Spring of every year. 1(0-3) P: (MMG 201 or concurrently) or (MMG 301 or concurrently)
PCR Methodology of microbiology. Microscopy, staining, aseptic technique, media, quantification, diagnostics, and laboratory safety.
SA: MIC 302
Effective Spring 2009 Effective Spring 2014
### MMG 404  Human Genetics
- **Fall of every year. Spring of every year. 3(3-0)** P: (ZOL 341) and (BMB 401 or concurrently or BMB 461 or concurrently) and completion of Tier I writing requirement. P: ZOL 341
- **SA:** ZOL 344, ZOL 404
- **Effective Summer 2010 Effective Spring 2014**

### MMG 408  Advanced Microbiology Laboratory (W)
- **Fall of every year. 3(1-6)** P: (MMG 302 and MMG 431 or concurrently) and completion of Tier I writing requirement. P: (MMG 302 and (MMG 431 or concurrently)) and completion of Tier I writing requirement R: Open only to students in the Department of Microbiology and Molecular Genetics or LBS Environmental Biology/Microbiology or Microbiology coordinate major. R: Open to students in the Department of Microbiology and Molecular Genetics or in the Genetics Major or in the Environmental Biology/Microbiology Major or in the Microbiology Major.
- **PCR** Microbiological techniques and procedures to study physiology and genetics of bacteria and bacteriophages. Collection and critical assessment of quantitative data and written communication of results.
- **SA:** MPH 408
- **Effective Fall 2001 Effective Spring 2014**

### MMG 409  Eukaryotic Cell Biology
- **Spring of every year. 3(3-0)** P: (BS 161 or LB 145 or BS 181H) and ((BMB 401 or concurrently) or (BMB 462 or concurrently))
- **PCR** Structure and function of nucleated cells. Emphasis on the molecular mechanisms that underlie cell processes.
- **SA:** MIC 403, MPH 403
- **Effective Fall 2011 Effective Spring 2014**

### MMG 413  Virology
- **Spring of every year. 3(3-0)** P: (BMB 462 or concurrently) or BMB 401
- **Effective Spring 2009 Effective Spring 2014**

### MMG 421  Prokaryotic Cell Physiology
- **Fall of every year. 3(3-0)** P: (MMG 301 and (BMB 461 or concurrently)) or (MMG 301 and (BMB 401 or concurrently))
- **PCR** Prokaryotic cell structure and function. Growth and replication. Macromolecular synthesis and control.
- **SA:** MIC 401, MPH 401
- **Effective Fall 2010 Effective Spring 2014**

### MMG 425  Microbial Ecology
- **Spring of every year. 3(3-0)** Interdepartmental with Crop and Soil Sciences. RB: MMG 301
- **PCR** Microbial population and community interactions. Microbial activities in natural systems, including associations with plants or animals.
- **SA:** MPH 425
- **Effective Fall 2004 Effective Spring 2014**

### MMG 431  Microbial Genetics
- **Fall of every year. 3(3-0)** P: (BMB 461 or concurrently) or (BMB 401 or concurrently) RB: MMG 301 or ZOL 341
- **PCR** Genetics of bacteria, their viruses, plasmids, and transposons. Emphasis on genetic principles.
- **SA:** MIC 401, MPH 401
- **Effective Fall 2010 Effective Spring 2014**
PART III – COURSE CHANGES

MMG 433  Microbial Genomics
Spring of every year. 3(2-3) 3(3-0) P: (MMG 431) RB: (MMG 421 or BMB 461) and CSE 101
*Effective Fall 2005 Effective Fall 2015*

MMG 434  Laboratory in Genomics and Molecular Genetics (W)
Spring of every year. 3(1-6) 4(1-8) P: ((MMG 301) and completion of Tier I writing requirement) and (MMG 431 or MMG 433) P: (MMG 301 and (MMG 433 or concurrently)) and completion of Tier I writing requirement R: Open to students in the Genomics and Molecular Genetics Major or in the Lyman Briggs Genomics and Molecular Genetics Coordinate Major.
PCR Genomics and molecular genetic techniques using microbes. Collection and critical assessment of quantitative data and written communication of results.
*Effective Fall 2011 Effective Spring 2014*

MMG 445  Microbial Biotechnology (W)
Fall of every year. Summer of every year. 3(3-0) P: (MMG 301 or BMB 461 or BMB 401) and completion of Tier I writing requirement
PCR Applications of microbial products and processes in areas such as biopharmaceuticals, bioremediation, biocatalysis and other green chemistries.
SA: MIC 445
*Effective Summer 2010 Effective Spring 2014*

MMG 451  Immunology
Fall of every year. 3(3-0) P: (BS 161 or LB 145 or BS 181H) and ((BMB 401 or concurrently) or (BMB 461 or concurrently)) Not open to students with credit in BLD 434.
SA: MPH 451
*Effective Summer 2013 Effective Spring 2014*

MMG 461  Medical Microbiology
Fall of every year. 3(3-0) Interdepartmental with Biomedical Laboratory Diagnostics. P: MMG 301 or (MMG 201 and BS 161) or (MMG 201 and LB 145) or (MMG 201 and BS 181H) RB: MMG 451 or BLD 434 R: Open to juniors or seniors in the Biomedical Laboratory Diagnostics Program or in the Department of Microbiology and Molecular Genetics or in the Biomedical Laboratory Science Major or in the Lyman Briggs Biomedical Laboratory Science Coordinate Major or in the Lyman Briggs Environmental/Biology/Microbiology Coordinate Major or in the Environmental Biology/Microbiology Major or in the Genomics and Molecular Genetics Major or in the Lyman Briggs Genomics and Molecular Genetics Coordinate Major or in the Lyman Briggs Human Biology Coordinate Major or in the Human Biology Major or in the Microbiology Major or in the Lyman Briggs Microbiology Coordinate Major.
PCR Properties of pathogenic bacteria and viruses and their mechanisms of pathogenicity and clinical diagnoses.
SA: MIC 463
*Effective Fall 2013 Effective Spring 2015*
MMG 464  Diagnostic Microbiology Laboratory  
Fall of every year. 2(0-4) Interdepartmental with Biomedical Laboratory Diagnostics. P: MMG 463 or concurrently R: Open to juniors or seniors in the Department of Microbiology and Molecular Genetics or in the Biomedical Laboratory Diagnostics Program or in the Clinical Laboratory Sciences major. R: Open to juniors or seniors in the Biomedical Laboratory Diagnostics Program or in the Department of Microbiology and Molecular Genetics or in the Lyman Briggs Biomedical Laboratory Science Coordinate Major or in the Lyman Briggs Genomics and Molecular Genetics Coordinate Major or in the Lyman Briggs Microbiology Coordinate Major. 
PCR  Clinical laboratory diagnostic procedures for the identification of pathogenic microbes. 
SA: MIC 464  
Effective Fall 2008  Effective Fall 2013

MMG 490  Special Problems in Microbiology  
Fall of every year. Spring of every year. Summer of every year. 1 to 3 credits. A student may earn a maximum of 6 credits in all enrollments for this course. R: Approval of department.  
PCR  Library research or tutorial instruction in advanced laboratory techniques.  
SA: MPH 490  
Effective Fall 2004  Effective Spring 2014

MMG 491  Current Topics in Microbiology and Molecular Genetics  
Spring of every year. 3(4-0) R: Open to seniors in the Lyman Briggs College or in the Department of Microbiology and Molecular Genetics or in the Lyman Briggs Genomics and Molecular Genetics Coordinate Major.  
PCR  Capstone experience for microbiology majors. Presentation and discussion of journal articles. Writing of position papers. Topics such as microbial physiology, ecology, genetics, molecular biology, virology, immunology, or pathogenesis.  
SA: MIC 491  
Effective Spring 2009  Effective Spring 2014

MMG 492  Undergraduate Research Seminar  
Spring of every year. 1(2-0) P: MMG 499 or MMG 499H R: Open to students in the Department of Microbiology and Molecular Genetics or in the Lyman Briggs Genomics and Molecular Genetics Coordinate Major.  
PCR  Presentation and group discussion of undergraduate research results.  
SA: MIC 492  
Effective Spring 2009  Effective Spring 2014

MMG 499  Undergraduate Research  
Fall of every year. Spring of every year. Summer of every year. 1 to 3 credits. A student may earn a maximum of 6 credits in all enrollments for this course. R: Open to students in the Department of Microbiology and Molecular Genetics or in the Lyman Briggs Genomics and Molecular Genetics Coordinate Major. R: Open to students in the Department of Microbiology and Molecular Genetics or in the Lyman Briggs Environmental/Biology/Microbiology Coordinate Major or in the Lyman Briggs Genomics and Molecular Genetics Coordinate Major or in the Lyman Briggs Microbiology Coordinate Major.  
PCR  Participation in a laboratory research project.  
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.  
SA: MIC 499  
Effective Fall 2008  Effective Spring 2014
MMG 499H  Honors Research  
Fall of every year. Spring of every year. Summer of every year. 1 to 3 credits. A student may earn a maximum of 6 credits in all enrollments for this course. R: Open to students in the Department of Microbiology and Molecular Genetics and open to students in the Lyman Briggs College. R: Open to students in the Department of Microbiology and Molecular Genetics or in the Lyman Briggs Environmental/Biology/Microbiology Coordinate Major or in the Lyman Briggs Genomics and Molecular Genetics Coordinate Major or in the Lyman Briggs Microbiology Coordinate Major.

PCR  Research project with thesis and oral report. A portion of Microbiology or Genomics and Molecular Genetics capstone experience. 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. SA: MIC 499H 
Effective Fall 2014

DEPARTMENT OF PHYSICS AND ASTRONOMY

PHY 491  Atomic, Molecular, and Condensed Matter Physics
Introduction to Condensed Matter Physics  
Fall of every year. 3(3-0) P: (PHY 471 and PHY 410) and completion of Tier I writing requirement Not open to students with credit in PHY 801.

Many-electron atoms, Molecules, crystal structure, lattice dynamics, Band models of metals and semiconductors, Transport properties. Many-electron atoms, Molecules, crystal structure, lattice dynamics. Band models of metals and semiconductors, transport properties.
Effective Fall 2013 Effective Fall 2015

PHY 492  Nuclear and Elementary Particle Physics
Introduction to Nuclear Physics  
Spring of every year. 3(3-0) P: (PHY 471) and completion of Tier I writing requirement RB: PHY 472 Not open to students with credit in PHY 802.

Effective Fall 2013 Effective Fall 2015

DEPARTMENT OF RADIOLOGY

ANTR 585  Directed Study in Human Prosection  
Fall of every year. Spring of every year. Summer of every year. 1 to 5 credits. A student may earn a maximum of 15 credits in all enrollments for this course. P: ANTR 551 P: ANTR 551 or ANTR 510 R: Open only to graduate-professional students in the College of Human Medicine or College of Osteopathic Medicine and approval of department. R: Open to human medicine students or osteopathic medicine students. Approval of department.

Prosection of selected regions and isolated structures of preserved human cadavers. Oral presentation. 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 2002 Effective Spring 2015

DEPARTMENT OF STATISTICS AND PROBABILITY

STT 464  Statistics for Biologists  
Fall of every year. 3(3-0) Interdepartmental with Animal Science and Crop and Soil Sciences. P: STT 424 P: MTH 103 or MTH 110 or MTH 116 RB: STT 421

Biological random variables. Estimation of population parameters. Testing hypotheses. Linear correlation and regression. Analyses of counted and measured data to compare several biological groups including contingency tables and analysis of variance.
Effective Fall 2014