PART I – NEW ACADEMIC PROGRAMS AND PROGRAM CHANGES

COLLEGE OF AGRICULTURE AND NATURAL RESOURCES

1. Request to delete the curriculum and degree requirements for the Bachelor of Science degree in Technology Systems Management in the Department of Biosystems and Agricultural Engineering. The University Committee on Undergraduate Education (UCUE) will provide consultative commentary to the Provost after considering this request. The Provost will make a determination after considering the consultative commentary from the University Committee on Undergraduate Education.

No new students are to be admitted to the program effective Spring 2011. No students are to be readmitted to the program effective Spring 2011. Effective Summer 2016, coding for the program will be discontinued and the program will no longer be available in the College of Agriculture and Natural Resources. Students who have not met the requirements for the Bachelor of Science degree in Technology Systems Management through the College of Agriculture and Natural Resources prior to Summer 2016 will have to change their major.

2. Request to change the requirements for the Master of Science degree in Packaging in the School of Packaging. The University Committee on Graduate Studies (UCGS) will consider this request at its March 14, 2016 meeting.

   a. Under the heading Requirements for the Master of Science Degree in Packaging make the following changes:

      (1) Under the heading Additional Requirements for Plan A replace item 1. with the following:

            Packaging 825 and 860.

      (2) Under the heading Additional Requirements for Plan B replace item 1. with the following:

            Packaging 805, 815, and 825.

Effective Fall 2016.

3. Request to change the requirements for the Doctor of Philosophy degree in Packaging in the School of Packaging. The University Committee on Graduate Studies (UCGS) will consider this request at its March 14, 2016 meeting.

   a. Under the heading Requirements for the Doctor of Philosophy Degree in Packaging make the following changes:

      (1) In item 1. delete the following course:

            PKG  992   Packaging Seminar  2

            Add the following course:

            PKG  860   Research Methods  3

      (2) Replace item 4. with the following:

            Complete a dissertation in one of the following areas of packaging: material science applications in packaging, food packaging, healthcare packaging, mass transport applications, dynamics and physical distribution aspects or human factors in packaging.

Effective Fall 2016.
COLLEGE OF HUMAN MEDICINE

1. Request to change the requirements for the Professional Program in Human Medicine leading to the Doctor of Medicine (M.D.) degree. The University Committee on Graduate Studies (UCGS) will consider this request at its March 14, 2016 meeting.
   a. Under the heading PROGRAM IN HUMAN MEDICINE make the following changes:
      (1) Delete the heading CURRICULUM and the section LEGACY PATHWAY that follows.
      (2) Change the heading SHARED DISCOVERY PATHWAY to SHARED DISCOVERY CURRICULUM and replace the first two paragraphs with the following:
          The College of Human Medicine’s Shared Discovery Pathway is designed to be responsive to the health care needs of Michigan, the country, and in the educational best interests of diverse learners. The curriculum represents a significant departure from present educational models by emphasizing usefulness and experience as the motivating framework for adult medical education. It features the blending of pedagogy and action reverting back more than a century to the traditional medical education of the last 80 years.
          The design of the curriculum is based on a set of guiding principles which are divided into two categories. The core principles are envisioned as the foundation to all learning within the curriculum. The critical additional principles are critical to the college’s vision and mission and should be reflected in the experiences of any graduate of our program.
      (3) Under the heading SHARED DISCOVERY CURRICULUM, subheading Early Clinical Experience, replace the last paragraph with the following:
          Immunizations and fever, upper respiratory tract infections, knee and back joint pain, blood pressure dysregulation, palpitations, health maintenance, introduction to evidence-based medicine, depression and anxiety, dyspnea, abdominal pain, dysuria, blood glucose dysregulation, dizziness, vertigo, disequilibrium, and syncope.

   Effective Fall 2016.

2. Request to establish a Graduate Certificate in Leadership in Medicine for the Underserved in the College of Human Medicine. The University Committee on Graduate Studies (UCGS) recommended approval of this request at its February 1, 2016 meeting.

   The Graduate Certificate in Leadership in Medicine for the Underserved is a Type 2 graduate certificate and will appear on the transcript as “Graduate Certificate Program in Leadership in Medicine for the Underserved”.

   a. Background Information:

      The proposed graduate certificate is rooted in the mission statement of the college and university, and commitment to its success is demonstrated by academic, administrative and faculty support. By emphasizing the responsibility of medical education to develop physicians who will care for the entire community, the College of Human Medicine developed this experiential learning program which focuses on providing care for underserved populations, working to improve healthcare delivery for these patients, understanding the public health system, learning how to advocate for change, and contributing to the community through service and research. An overarching theme of the curriculum is to understand how poverty, social justice and health status impact the populations served and the choices physicians make in providing an environment of care to meet these needs. Whether the patient is a homeless person in Flint, Michigan or farmer in Las Delicias, El Salvador, a physician needs to be able to examine and understand how the determinants of health and the health care system interact, and how health status is impacted by poverty, access to care, neighborhood conditions, safety, income inequality, vulnerability of underserved groups, and the role of social justice advocacy, eliminating health disparities, and equity.

      This certificate program is offered to students coming to the Flint Campus and is optional. Once committed however, the student will participate in required activities and didactics above and
b. **Academic Programs Catalog Text:**

The Graduate Certificate in Leadership in Medicine for the Underserved prepares physicians to address the needs of medically underserved and vulnerable populations of the United States and abroad. The graduate certificate is available to students currently pursuing the Professional Program in Human Medicine leading to the Doctor of Medicine degree.

**Requirements for the Graduate Certificate in Leadership in Medicine for the Underserved**

**CREDITS**

Students must successfully complete the following:

1. Participation in 130 hours of didactic/experiential learning sessions during Block III of the professional program.
2. Participation in 88 self-directed volunteer hours during Block III and IV of the professional program.
3. Completion of the following courses during Block IV (12 credits):
   - HM 629 Leadership in Medicine for Underserved or Vulnerable Communities 6
   - HM 631 Advanced Leadership in Medicine for Underserved or Vulnerable Communities 6

Effective Fall 2016.

3. Request to establish a **Graduate Certificate in Leadership in Rural Medicine** in the College of Human Medicine. The University Committee on Graduate Studies (UCGS) will consider this request at its February 1, 2016 meeting.

   The Graduate Certificate in Leadership in Rural Medicine is a Type 2 graduate certificate and will appear on the transcript as “Graduate Certificate Program in Leadership in Rural Medicine”.

a. **Background Information:**

Michigan is a predominantly rural state, with 75% of Michigan’s land mass designated as rural and 20% of the state’s population living in rural areas. Both in rural Michigan and rural America, there is a severe, disproportionate, and persistent shortage of physicians. As a leader in community-based medical education with a mission of social responsibility, Michigan State University’s College of Human Medicine is uniquely poised to address this disparity. The Leadership in Rural Medicine graduate certificate is designed to identify College of Human Medicine (CHM) students currently pursuing the Program in Human Medicine leading to the Doctor of Medicine degree who are interested in becoming rural physicians and to provide comprehensive and longitudinal training opportunities for those students in rural and remote areas. The certificate’s overriding educational goal is for students to develop the confidence, comfort, and professional and personal skills necessary to care for patients in rural and remote areas.

CHM currently has three established clinical communities located in rural counties—the Upper Peninsula Regional Campus, the Traverse City Regional Campus, and the Midland Regional Campus. Students accepted to the Graduate Certificate in Leadership in Rural Medicine will be assigned to one of these three clinical communities for the third and fourth year of training of their professional program. Students accepted to the Rural Community Health Program (R-CHP) will be
placed in either the Traverse City or Midland Regional Campuses. Students accepted to the Rural Physician Program (RPP) will be assigned to the Upper Peninsula Regional Campus.

In addition to the main clinical community assignment, R-CHP students will have an identified rural educational site in a more remote part of the state. Students will spend at least 12 weeks of their clinical requirements in this more remote community. Students in the RPP will spend at least 12 weeks of their clinical requirements in various rural communities in the Upper Peninsula of Michigan.

This certificate program will be a voluntary option for MSU-CHM students assigned to these campuses. Once committed, the student will participate in required activities and didactics above and beyond the usual professional program curriculum. Components of the additional curriculum include:

**Preclinical:** Students will have an enhanced preclinical curriculum consisting of 16 contact hours featuring faculty and guest presenters introducing key concepts of rural medicine. Topics may include an overview of rural health care including policies, systems, and population-based care, special problems and approaches in rural health care, organization and management of rural care systems, and life and practice in rural communities. In addition, students will spend 32 contact hours in an approved rural site following their 1st year of medical school. During this experience, students will work with a primary care physician and will receive an overview of the rural community and health care system.

**Clinical:** During Block III of the professional program, students will spend at least 12 weeks of clinical training within a rural educational community. Many of these weeks will be during core rotations, however graduate certificate students will also commit to using 8 weeks of elective time within a more remote rural community. These electives may occur during the student’s third or fourth year of training depending on the specific requirements of the assigned clinical community.

**Scholarly:** Students will complete a scholarly or research project related to their rural educational site. This project may be completed individually or in groups and should involve mentorship from the rural public health director or rural physicians. Upon completion, the project will be presented to the local community, to peer graduate certificate student groups and faculty, or to a statewide or national audience (presentation or publication) depending on the scope of project.

### b. Academic Programs Catalog Text:

The Graduate Certificate in Leadership in Rural Medicine trains students to possess a special set of knowledge, skills and attitudes enabling them to better understand address the medical needs and provision of healthcare to individuals living in rural and remote communities. The graduate certificate is available to students currently pursuing the Professional Program in Human Medicine leading to the Doctor of Medicine degree.

**Requirements for the Graduate Certificate in Leadership in Rural Medicine**

Students must successfully complete the following:

1. Participation in 90% or more the additional didactic sessions during Block I and Block II years of the professional program.
2. Participation in the 32-hour preclinical experience in a rural community.
3. Completion of at least 12 weeks’ clinical experience in a rural or remote education setting during Block III of the professional program.
4. Completion of additional clinical experience in the rural community.
5. One of the following rural elective options (12 credits):
   a. Students in the Rural Physician Program (RPP):
      - FM 608 Family Practice Clerkship 6
      - HM 632 Rural Community Health 6
   b. Students in the Rural Community Health Program (R-CHP):
      - HM 632 Rural Community Health 6
      - HM 633 Advanced Rural Community Health 6
6. Completion of a scholarly presentation or publication.
7. Completion of portfolio or additional assignments as assigned by the student’s advisor.

Effective Fall 2016.

COLLEGE OF NATURAL SCIENCE

1. Request to change the requirements for the Premedical Program in the College of Natural Science.
   a. Under the heading Requirements for the Premedical Program make the following changes:
      (1) In item 1. a. delete the following courses:
           BS 110 Organisms and Populations 4
           BS 111 Cells and Molecules 3
           BS 111L Cell and Molecular Biology Laboratory 2
           Add the following courses:
           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) Add the following item 1. e.:
           3 or 4 credits in statistics.
      (3) In item 2., replace paragraph two with the following:
           Students who are enrolled in the Premedical Program (including Pre–Osteopathy, Pre–Podiatry, Pre-Pharmacy, and Pre-Physician's Assistant) in the College of Natural Science may complete an alternative track to Integrative Studies in Biological and Physical Sciences that consists of the following courses: Biological Science 161, 171, 162, and 172 and Chemistry 141. The completion of Biological Science 171 satisfies the laboratory requirement. Biological Science 161, 171, 162, and 172 and Chemistry 141 may be counted toward both the alternative track and the requirements for the premedical program referenced in item 1. a. above.

Effective Fall 2016.

2. Request to change the requirements for the Predental Program in the College of Natural Science.
   a. Under the heading Requirements for the Predental Program make the following changes:
      (1) In item 1. a. delete the following courses:
           BS 110 Organisms and Populations 4
           BS 111 Cells and Molecules 3
           BS 111L Cell and Molecular Biology Laboratory 2
           Add the following courses:
           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) Replace item 1. c. with the following:

3 credits in a biological science course in addition to Biological Science 161, 171, 162, and 172.

(3) Add the following item 1. d.:

3 or 4 credits in statistics.

(4) In item 2., replace paragraph two with the following:

Students who are enrolled in the Predental Program in the College of Natural Science may complete an alternative track to Integrative Studies in Biological and Physical Sciences that consists of the following courses: Biological Science 161, 171, 162, 172 and Chemistry 141. The completion of Biological Science 171 satisfies the laboratory requirement. Biological Science 161, 171, 162, and 172 and Chemistry 141 may be counted toward both the alternative track and the requirements for the predental program referenced in item 1. a. above.

Effective Fall 2016.

3. Request to delete the curriculum and degree requirements for the Bachelor of Science degree in Diagnostic Molecular Science in the Biomedical Laboratory Diagnostics Program. 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 Spring 2013. No students are to be readmitted to the program effective Spring 2013. Effective Fall 2015, coding for the program will be discontinued and the program will no longer be available in the Biomedical Laboratory Diagnostics Program. Students who have not met the requirements for the Bachelor of Science degree in Biomedical Laboratory Diagnostics Program through the College of Natural Science prior to Fall 2015 will have to change their major.
COLLEGE OF NURSING

1. Request to change the requirements for the Bachelor of Science in Nursing degree in Nursing in the College of Nursing.
   
a. Under the heading Requirements for the Bachelor of Science in Nursing Degree in Nursing make the following changes:
   
   (1) In item 2. a. delete the following course:
   
   HNF 260 Principles of Human Nutrition 3
   
   Add the following course:
   
   HNF 150 Introduction to Human Nutrition 3
   
   b. Under the heading Admission to the Second Bachelor's Degree Program make the following changes:
   
   (1) Delete the following course:
   
   HNF 260 Principles of Human Nutrition 3
   
   Add the following course:
   
   HNF 150 Introduction to Human Nutrition 3
   
   Effective Fall 2016.
PART II - NEW COURSES AND CHANGES

COLLEGE OF AGRICULTURE AND NATURAL RESOURCES

ENT 460  Medical Entomology
Spring of odd years. 3(3-0) 3(2-2) P: ENT 404 or MMG 201 or MMG 301 or approval of department
R: Open to juniors and open to seniors and open to graduate students.
Transmission and management of infectious diseases involving insects and arachnids.
Effective Fall 2013 Effective Spring 2016

FW 364  Ecological Problem Solving
Fall of every year. Spring of odd years. 3(2-2) P: ((MTH 124 or concurrently) or (MTH 132 or concurrently)) and (LB 118 or concurrently) and (ZOL 365 or BE 230) P: ((MTH 124 or concurrently) or (MTH 132 or concurrently) or (LB 118 or concurrently)) and (STT 224 or STT 231 or STT 421) and (IBIO 355 or BE 230)
Application of ecological concepts and models to problems in natural resource and ecosystem management.
Effective Fall 2014 Effective Fall 2016

FW 413  Wildlife Research and Management Techniques
Fall of every year. 3(4-0) 3(2-3) P: (FW 101L or FW 238) and completion of Tier I writing requirement
Field techniques used in collecting, analyzing, and communicating data on wild animal populations and their habitats. Field trips required.
Effective Fall 2014 Effective Fall 2016

FW 414  Aquatic 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
Management of aquatic habitats and populations for ecological and socioeconomic objectives; human impacts on aquatic ecosystems.
Field trips required.
Effective Fall 2014 Effective Fall 2016

FW 434  Human Dimensions of Fisheries and Wildlife Management (W)
Fall of every year. Spring of every year. 3(2-2) P: (ZOL 355) and completion of Tier I writing requirement P: (IBIO 355) and completion of Tier I writing requirement R: Open to juniors or seniors or approval of department.
Sociological implications of public policy and planning processes in fisheries and wildlife management.
Effective Fall 2014 Effective Fall 2016

FW 479  Fisheries Management
Spring of every year. 3(2-2) P: ZOL 355 and (FW 364 or concurrently) or approval of department P: IBIO 355 and (FW 364 or concurrently) or approval of department
Quantitative analysis of fish populations. Case study of ecological interactions linking fish to aquatic ecosystems and the challenge of balancing multiple human values in managing fisheries resources. Field trips required.
Effective Fall 2014 Effective Fall 2016

FW 885  Leadership in Natural Resources and Environmental Management
Fall of even years. Fall of odd years. 3(3-0) Interdepartmental with Agricultural Economics and Forestry, Interdepartmental with Forestry
Theory and practice of leadership in natural resource and environmental management. Integration across disciplinary and jurisdictional divisions.
Effective Fall 2010 Effective Fall 2016
HNF 102  Dietary Supplements: Evidence vs Hype  
Summer of every year. 3(3-0)  
NEW  Effects of dietary supplements such as vitamins, herbs, and performance enhancers and functional foods on health and performance. Evaluation of supplement safety and effectiveness. Laws and policies relative to health claims.  
Effective Summer 2016

FOR 875  R Programming for Data Sciences  
Summer of every year. 3(3-0) Interdepartmental with Statistics and Probability. RB: Familiarity with at least one computer operating system  
NEW  Programming in R and use of associated Open Source tools. Addressing practical issues in documenting workflow, data management, and scientific computing.  
Effective Summer 2017

FOR 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 24 credits in all enrollments for this course. A student may earn a maximum of 36 credits in all enrollments for this course. R: Open to doctoral students in the College of Agriculture and Natural Resources or in the Department of Forestry or in the Forestry Major. Approval of department; application required.  
Doctoral dissertation research.  
Request the use of the Pass-No Grade (P-N) system.  
Effective Summer 2014 Effective Spring 2016

HRT 215  Horticulture Industries Seminar  
Fall of every year. 1(1-0) RB: Interest or experience in the 'green industries'. R: Open to students in the Institute of Agricultural Technology. Not open to students with credit in HRT 207.  
Horticulture operations, products, services and marketing practices. Personal and professional development, career opportunities.  
SA: HRT 064  
DELETE COURSE  
Effective Spring 2016

HRT 391  Special Topics  
Fall of every year. Spring of every year. 1 to 2 credits. A student may earn a maximum of 9 credits in all enrollments for this course.  
Specific topics in horticulture of current interest and importance. Possible field trips. Offered half of semester.  
DELETE COURSE  
Effective Spring 2016

HRT 419  Landscape Design Practicum  
Fall of every year. 2 to 4 credits. A student may earn a maximum of 6 credits in all enrollments for this course. P: HRT 111 or HRT 311 R: Approval of department; application required.  
Application of landscape design theory and practice to landscape development projects. Client interaction, site visits and design, plan development, and construction and management specifications. Residential, commercial and public landscape projects.  
DELETE COURSE  
Effective Spring 2016
PKG 330  Package Graphics
Packaging for Fast-Moving Consumer Goods
Fall of every year. 3(3-0) P: PKG 221 P: PKG 315 and PKG 322 and PKG 323 R: Open to sophomores or juniors or seniors in the School of Packaging.  R: Open to juniors or seniors or graduate students in the School of Packaging.
SA: PKG 330
Effective Fall 2014  Effective Fall 2016

PKG 460  Distribution Packaging and Performance Testing
Spring of every year. 3(2-2) P: PKG 410 R: Open to sophomores or juniors or seniors or graduate students in the School of Packaging.
Interrelationships between packaging and distribution systems. Transportation, material handling, warehousing, Logistics and management systems. Performance testing and industry practices. Package container design and testing.
DELETE COURSE
Effective Fall 2016

PKG 825  Polymeric Packaging Materials
Fall of every year. 4(3-2) RB: Graduate students with chemistry, physics, and mathematics backgrounds.
NEW
Physical, mechanical and chemical properties of packaging polymers and multilayer structures; relationship between properties and performance of packaging materials and systems; processing of packaging plastics.
Effective Fall 2016

PKG 826  Principles of Scholarship: Integrity, Ethics and Research
Fall of every year. 2(2-0) Interdepartmental with Agriculture and Natural Resources.
Principles, considerations, expectations and culture of professional scholarship.
Request the use of the Pass-No Grade (P-N) system.
DELETE COURSE
Effective Fall 2016

PKG 827  Polymeric Packaging Materials
Fall of every year. 3(3-0) RB: PKG 323 or PKG 801
Physical and chemical properties of polymeric materials and structures used in packaging. Relationship of properties to performance.
SA: PKG 825
DELETE COURSE
Effective Fall 2016

PKG 828  Processing and Applications of Packaging Plastics
Spring of every year. 3(3-0)
DELETE COURSE
Effective Fall 2016

PKG 829  Packaging Plastics Laboratory
Fall of every year. 1(0-2) Not open to students with credit in PKG 825.
Structure versus property relationships and plastics processing.
DELETE COURSE
Effective Fall 2016
PKG 860 Research Methods
Fall of every year. 3(3-0) RB: General statistics and research knowledge.
NEW Principles and expectations for responsible conduct of research in packaging. Integrity of the research process, critical thinking, scientific methods, proposal writing, and scientific communications.
Effective Fall 2016

PKG 880 Life Cycle Assessment: Background, Principles, Calculations, and Applications
Spring of every year. 3(2-2) RB: Graduate students with chemistry, physics and mathematics backgrounds. R: Open to graduate students.
NEW Determination of the environmental footprint of products, packages and systems during their entire life-cycle using life cycle assessment (LCA) methodology. Introduction to the theory and application of LCA.
Effective Fall 2016

CSS 135 Crop Scouting and Investigation
Spring of every year. 3(4-0) Interdepartmental with Horticulture. P: CSS 101 or HRT 203 RB: CSS 101L R: Open to undergraduate students or agricultural technology students.
Crop scouting for improved crop management. Field diagnosis. Interaction with agriculture clientele. Precision agriculture influence on crop scouting. Offered first ten weeks of semester. Crop scouting and agricultural clientele interactions for improved crop management. Offered first ten weeks of semester.
Effective Spring 2016

CSS 143 Introduction to Soil Science
Fall of every year. Spring of every year. 2(2-0) R: Open to agricultural technology students in the Institute of Agricultural Technology. Not open to students with credit in CSS 210.
NEW Soil and its impact on plant growth, plant and water relations, drainage, nutrients, soil as a resource, and erosion control techniques. This is an online course.
Effective Fall 2016

CSS 202L World of Turf Lab
Fall of every year. Summer of every year. 1(0-2) P: CSS 202 or concurrently Not open to students with credit in CSS 232.
Effective Spring 2014 Effective Summer 2016

CSS 292 Management of Turfgrass Weeds
Fall of every year. 3(2-2) P: CSS 232 RB: PLB 105
Chemical, biological, and cultural methods of managing cool- and warm-season turfgrass weeds. Environmental considerations in weed management.
DELETE COURSE
Effective Spring 2016

CSS 493 Professional Internship in Crop and Soil Sciences
Fall of every year. Spring of every year. Summer of every year. 3 credits. A student may earn a maximum of 6 credits in all enrollments for this course. P: Completion of Tier I writing requirement. P: Completion of Tier I Writing Requirement. R: Approval of department; application required. R: Approval of department; application required. A student may earn a maximum of 6 credits in all enrollments for any or all of these courses: ABM 493, ANR 493, ANS 493, CMP 493, CSS 493, CSUS 493, EEP 493, FIM 493, FSC 493, FW 493, HRT 493, PKG 493, and PLP 493.
Supervised professional experiences in agencies and businesses related to crop and soil sciences and environmental soil sciences. Supervised professional experiences in crop and soil sciences. This is an online course.
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 2014 Effective Summer 2016
PLP 101  Current Issues and Frontiers in Plant Pathology  
Fall of every year. 1(1-0)  
Basic principles of plant disease and plant pathogens. Current topics and future opportunities in the discipline of plant pathology.  
DELETE COURSE  
Effective Spring 2016

COLLEGE OF ENGINEERING

CE 841  Traffic Flow Theory  
Spring of every year. 3(3-0)  
REINSTATEMENT  
Microscopic and macroscopic traffic flow models, Queueing theory. Gap acceptance. Simulation models for network analysis. Intelligent vehicle highway systems.  
Effective Fall 2016

CE 844  Highway and Traffic Safety  
Fall of odd years. 3(3-0)  
REINSTATEMENT  
Effective Fall 2016

CE 847  Traffic Analysis and Control  
Spring of odd years. 3(3-0) P: CE 444 RB: Graduate student in transportation engineering  
REINSTATEMENT  
Modern traffic control and traffic modeling using state-of-the-art algorithms and computer models. Practical implications.  
Effective Fall 2017

CE 849  Transportation Research Methods  
Spring of every year. 3(3-0)  
REINSTATEMENT  
Application and interpretation of quantitative methods and design of experiments for transportation research; ANOVA, non-parametric, discriminant analysis, factor analysis, multivariate regression, SPSS.  
Effective Spring 2016

CE 850  Intelligent Transportation Systems (ITS)  
Fall of odd years. 3(3-0) RB: Traffic and Transportation engineering  
REINSTATEMENT  
Technical and policy aspects emerging from the application of advanced technologies to transportation problems. Intelligent Transportation Systems (ITS) user services requirements, available and emerging technologies, case studies of ongoing operational tests, legal institutional and planning issues related to ITS development and deployment.  
Effective Spring 2018

CE 851  Transportation and the Environment  
Spring of even years. 3(3-0) RB: B.S. in Civil Engineering with emphasis on transportation or environmental engineering R: Open only to graduate students in the College of Engineering.  
REINSTATEMENT  
Effective Spring 2017
COLLEGE OF HUMAN MEDICINE

HM 822  Introduction to Core Disciplines of Public Health for Medical Students
Fall of every year. Spring of every year. Summer of every year. 3(3-0) RB: Medical students with interest in public health. R: Open to students in the College of Human Medicine or approval of college. R: Open to students in the Human Medicine Major or approval of college.
Introduction to philosophy and concepts of discipline of public health and its relationship to clinical medicine. History and development of the profession; ethical, legal and political considerations.
Request the use of the Pass-No Grade (P-N) system.
Request the use of ET-Extension to postpone grading.
The work for the course must be completed and the final grade reported within 2 semesters after the end of the semester of enrollment.
Effective Summer 2015 Effective Summer 2016

HM 823  Medical Partners in Public Health: Special Seminars
Fall of every year. Spring of every year. Summer of every year. 3(3-0) P: HM 822 RB: Medical students with interest in public health. R: Open to students in the College of Human Medicine or approval of college. R: Open to students in the Human Medicine Major or approval of college.
Analysis, discussion, and application of key public health competencies in the community setting.
Request the use of the Pass-No Grade (P-N) system.
Request the use of ET-Extension to postpone grading.
The work for the course must be completed and the final grade reported within 2 semesters after the end of the semester of enrollment.
Effective Summer 2015 Effective Summer 2016

COLLEGE OF NATURAL SCIENCE

BLD 872  Clinical Mass Spectrometry Laboratory
Summer of every year. 2(1-2) P: BLD 870 and BLD 871 or approval of department RB: One course in protein chemistry or concurrent enrollment in same. R: Open to graduate students.
Sample preparation, instrument operation, data interpretation, and instrument maintenance as it relates to the clinical practice.
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 Summer 2016

CMSE 491  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 and lead to the development of new courses.
Effective Fall 2016

CMSE 499  Independent study in Computational Mathematics, Science, and Engineering
Fall of every year. Spring of every year. 1 to 4 credits. R: Approval of department. A student may earn a maximum of 6 credits.
Supervised individual research or study in an area of computational or data science.
Effective Fall 2016

GLG 446  Global Environmental Change, Water and Food Security
Fall of every year. 3(3-0) RB: General knowledge in Agricultural Sciences, (Plant, Soil, Water Sciences), and Environmental Sciences. R: Open to juniors or seniors or approval of department.
Impacts of climate variability and change on water availability, food security and global environmental change. Integrated models to identify adaption and mitigation strategies to such changes and to enhance the natural resources use efficiency.
Effective Fall 2016
IBIO 150 Integrating Biology: From DNA to Populations
Fall of every year. Spring of every year. 3(3-0) P: ((MTH 103 or concurrently) or (MTH 110 or concurrently) or (MTH 112 or concurrently) or (MTH 116 or concurrently) or (MTH 124 or concurrently) or (MTH 132 or concurrently) or (LB 118 or concurrently) or (MTH 201 or concurrently) or (STT 200 or concurrently) or (STT 201 or concurrently)) or designated score on Mathematics Placement test. R: Not open to undergraduate students in the Department of Integrative Biology.

NEW
Examine biological systems across multiple levels of organization - spatial, temporal, taxonomic - using evolutionary biology as the common thread.
Effective Fall 2016

MTH 920 Functional Analysis I
Functional Analysis
Spring of every year. 3(3-0) RB: MTH 828 R: Open to graduate students in the College of Natural Science or approval of department.
Effective Fall 1998 Effective Spring 2016

MTH 921 Functional Analysis II
Operator Theory
Fall of every year. 3(3-0) RB: MTH 829 and MTH 920 R: Open to doctoral students in the College of Natural Science or approval of department.
Topological vector spaces, convexity, Krein-Milman theorem, Banach algebras, operators on Banach spaces, spectral theorem, C*-algebras, Introduction to operator and spectral theory. Topics include Banach algebras, bounded and unbounded operators on Banach spaces, spectral theory for normal operators on a Hilbert space, C*-algebras, Schatten-von Neumann classes, the theory of Fredholm operators, semigroup theory.
Effective Fall 1998 Effective Fall 2016

MTH 928 Real Analysis II
Fall of every year. Spring of odd years. 3(3-0) RB: MTH 828 R: Open to doctoral students in the College of Natural Science or approval of department.
Effective Fall 1992 Effective Spring 2017

MTH 929 Complex Analysis II
Spring of every year. Spring of every year. 3(3-0) RB: MTH 828 and MTH 829 R: Open to doctoral students in the College of Natural Science or approval of department.
Effective Fall 1993 Effective Spring 2018
MTH 940  
**Applied Analysis I**  
Topics in Partial Differential Equations (PDE) for Applied Math  
**Fall of every year, Fall of odd years, 3(3-0) RB: MTH 828 R: Open to doctoral students in the College of Natural Science or approval of department.**  
- Sobolev spaces, trace theorem, imbedding theorems, sectorial forms, linear elliptic boundary and eigenvalue problems. PDE techniques that frequently appear in applied math. It includes: bifurcation theory, PDE as dynamical systems, boundary layers, asymptotic analysis, matched asymptotics/singular perturbations, and time permitting some homogenization examples.  
*Effective Fall 1995 Effective Fall 2016*

MTH 941  
**Applied Analysis II**  
Linear and Nonlinear Parabolic Equations  
**Spring of every year, Spring of even years, 3(3-0) RB: MTH 940 R: Open to doctoral students in the College of Natural Science or approval of department.**  
- Fixed point theorems. Variational methods. Applications to nonlinear integral and elliptic differential equations. Semigroup theory. Evolution equations that have a comparison principle— e.g. parabolic and Hamilton-Jacobi-Bellman equations. Both linear and nonlinear examples are treated, including some quasi-linear equations related to geometric flows. The emphasis is on existence and uniqueness of both classical solutions and weak solutions— so-called viscosity solutions.  
*Effective Fall 1995 Effective Spring 2018*

MTH 942  
**Foundations of Applied Mathematics I**  
Regularity for Second Order Elliptic Equations  
**Fall of every year, Fall of even years, 3(3-0) RB: MTH 848 and MTH 849 R: Open to doctoral students in the College of Natural Science or approval of department.**  
- Modeling in classical applied mathematics. Newtonian and continuum mechanics. Special mathematical techniques. A brief review of some classical results, such as Schauder and L-p theory, subsequently moving onto equations with coefficients of low regularity (i.e. only bounded and measurable) and nonlinear elliptic equations. The Harnack inequality and Holder regularity will be established in the context of both weak solutions of divergence form equations and viscosity solutions for equations in nondivergence form via respectively the methods of De Giorgi and Krylov-Safonov. Higher regularity and applications to minimization problems will be discussed.  
*Effective Fall 1995 Effective Fall 2016*

MTH 943  
**Foundations of Applied Mathematics II**  
Hyperbolic and Dispersive Equations  
**Spring of every year, Spring of odd years, 3(3-0) RB: MTH 942 R: Open to doctoral students in the College of Natural Science or approval of department.**  
- Continuation of MTH 942. This course covers some classical and modern techniques for higher dimensional hyperbolic and dispersive PDE, whose solutions spread out and decay due to wave packets traveling at different velocities.  
*Effective Fall 1995 Effective Spring 2017*

MTH 992  
**Special Topics in Analysis**  
Harmonic Analysis  
**Fall of every year, Fall of odd years, Spring of every year, 3 to 6 credits. A student may earn a maximum of 18 credits in all enrollments for this course. R: Approval of department. R: Open to doctoral students in the College of Natural Science or approval of department.**  
- Advanced topics in analysis.  
*Effective Fall 1993 Effective Fall 2017*
PHY 183B  Physics for Scientists and Engineers I
Summer of every year. 4 credits. P: (MTH 132 or concurrently) or (MTH 152H or concurrently) or (LB 118 or concurrently) Not open to students with credit in LB 273 or PHY 183 or PHY 193H or PHY 231 or PHY 231C.
Mechanics, Newton's laws, momentum, energy conservation laws, rotational motion, oscillation, gravity, waves. This course is given in the competency based instruction format. Mechanics, Newton's laws, momentum, energy conservation laws, rotational motion, oscillation, gravity, waves. This course is given online. You are required to have a modern laptop, high speed internet connection and webcam. Effective Fall 2013 Effective Summer 2017.

PHY 184B  Physics for Scientists and Engineers II
Summer of every year. 4 credits. P: ((PHY 183 or PHY 183B or PHY 193H or LB 273) or (PHY 231 and PHY 233B) or (PHY 231C and PHY 233B)) and ((MTH 133 or concurrently) or (MTH 153H or concurrently) or (LB 119 or concurrently)) Not open to students with credit in LB 274 or PHY 184 or PHY 232 or PHY 232C or PHY 234B or PHY 294H.
Electricity and magnetism, electromagnetic waves, light and optics, interference and diffraction. This course is given in the competency based instruction format. Electricity and magnetism, electromagnetic waves, light and optics, interference and diffraction. This course is given online, you are required to have a modern laptop, high speed internet connection and a webcam. Effective Fall 2014 Effective Summer 2017.

PHY 215B  Thermodynamics and Modern Physics
Summer of every year. 3 credits. P: ((PHY 184 or PHY 294H or LB 274 or (PHY 184B or concurrently)) or (PHY 232 and (PHY 234B or concurrently)) or (PHY 232C and (PHY 234B or concurrently)) and ((MTH 234 or concurrently) or (MTH 254H or concurrently) or (LB 220 or concurrently)) P: ((PHY 184 or PHY 294H or LB 274 or PHY 184B) or (PHY 232 and PHY 234B) or (PHY 232C and PHY 234B)) and ((MTH 234 or concurrently) or (MTH 254H or concurrently) or (LB 220 or concurrently)) Not open to students with credit in PHY 215.
Thermodynamics, atomic physics, quantized systems, nuclear physics, solids, elementary particles. This course is given in the competency based instruction format. Thermodynamics, atomic physics, quantized systems, nuclear physics, solids, elementary particles. Effective Fall 2013 Effective Summer 2017.

PHY 321  Classical Mechanics I
Fall of every year. Spring of every year. Summer of every year. 3(3-0) P: (PHY 184 or PHY 184B or PHY 294H or LB 274) and ((PHY 215 or concurrently) or (PHY 215B or concurrently)) and ((MTH 234 or concurrently) or (MTH 254H or concurrently) or (LB 220 or concurrently)) P: ((PHY 215 or concurrently) or (PHY 215B or concurrently)) and ((MTH 235 or concurrently) or (MTH 340 or concurrently) or (MTH 347H or concurrently))

PHY 390  Physics Journal Seminar
Fall of every year. Spring of every year. 1(3-0) P: Completion of Tier I Writing Requirement R: Open to juniors or seniors in the Lyman Briggs College or in the Department of Physics and Astronomy.
Written and oral reports on selected articles in the current literature. Critique of presentations by peers. DELETE COURSE Effective Fall 2016.
PHY 431  Optics I
Fall of every year. 3(2-3) P: (PHY 192 or LB 274) and (PHY 184 or PHY 184B or PHY 294H) and ((MTH 235 or concurrently) or (MTH 255H or concurrently)) and Completion of Tier I Writing Requirement. P: (((PHY 184 or PHY 184B or PHY 294H) and PHY 192 or LB 274) and ((MTH 235 or concurrently) or (MTH 340 or concurrently) or (MTH 347H or concurrently)) and completion of Tier I writing requirement.

- Lenses, aberrations, apertures, and stops. Diffraction, interferometry, spectroscopy, fiber optics.
- Effective Fall 2013 Effective Spring 2017

PHY 471  Quantum Physics I
Fall of every year. 3(3-0) P: (PHY 215 or PHY 215B) and (PHY 321 or concurrently) and (MTH 235 or MTH 255H or LB 220) P: (PHY 215 or PHY 215B) and (PHY 321 or concurrently) and (MTH 235 or MTH 340 or MTH 347H)

- Schroedinger equation, hydrogen atom, harmonic oscillator, and other one-dimensional systems.
- Effective Fall 2013 Effective Spring 2017

PHY 490  Senior Thesis
Physics Senior Thesis
Fall of every year. Spring of every year. Summer of every year. 1 to 4 credits. A student may earn a maximum of 5 credits in all enrollments for this course. P: (PHY 390) and completion of Tier I writing requirement. P: (PHY 471) and completion of Tier I writing requirement. R: Open to seniors in the Department of Physics and Astronomy. Approval of department.

- Design, carry out, and analyze an original experiment or computation. A written and oral report is required.
- 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 Fall 2013 Effective Spring 2017