PART I – NEW ACADEMIC PROGRAMS AND PROGRAM CHANGES

COLLEGE OF NATURAL SCIENCE

1. Request to change the requirements for the Bachelor of Science degree in Biological Science-Interdepartmental in the College of Natural Science. The Teacher Education Council (TEC) will consider this request at its October 3, 2016 meeting.

   a. Under the heading Requirements for the Bachelor of Science Degree in Biological Science-Interdepartmental make the following changes in item 3.:

   (1) In item 3. a. delete the following courses:

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

   Add the following courses:

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

   (2) In item 3. c. delete the following course:

   CEM 186H Honors Chemistry Laboratory II    2

   Add the following item (4):

   LB 171 Principles of Chemistry I     4
   LB 171L Introductory Chemistry Laboratory I    1
   LB 172 Principles of Chemistry II     3
   LB 172L Principles of Chemistry II-Reactivity Laboratory  1

   (3) Replace item 3. d. with the following:

   One course from each of the following groups (6 to 8 credits):

   (1) MTH 124 Survey of Calculus I     3
   MTH 132 Calculus I      3
   MTH 152H Honors Calculus I     4
   LB 118 Calculus I      4
   (2) MTH 126 Survey of Calculus II     3
   MTH 133 Calculus II     4
   MTH 153H Honors Calculus II     3
   LB 119 Calculus II     4
   STT 201 Statistical Methods     4
   STT 231 Statistics for Scientists     3
   STT 351 Probability and Statistics for Engineering     3
   STT 421 Statistics I     3

   (4) Replace item 3. e. with the following:

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

   (1) PHY 183 Physics for Scientists and Engineers I     4
   PHY 184 Physics for Scientists and Engineers II     4
   PHY 191 Physics Laboratory for Scientists, I     1
   PHY 192 Physics Laboratory for Scientists, II     1
   (2) PHY 193H Honors Physics I–Mechanics     4
   PHY 294H Honors Physics II–Electromagnetism     4
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHY 191</td>
<td>Physics Laboratory for Scientists, I</td>
<td>1</td>
</tr>
<tr>
<td>PHY 192</td>
<td>Physics Laboratory for Scientists, II</td>
<td>1</td>
</tr>
<tr>
<td>PHY 231</td>
<td>Introductory Physics I</td>
<td>3</td>
</tr>
<tr>
<td>PHY 232</td>
<td>Introductory Physics II</td>
<td>3</td>
</tr>
<tr>
<td>PHY 251</td>
<td>Introductory Physics Laboratory I</td>
<td>1</td>
</tr>
<tr>
<td>PHY 252</td>
<td>Introductory Physics Laboratory II</td>
<td>1</td>
</tr>
<tr>
<td>LB 273</td>
<td>Physics I</td>
<td>4</td>
</tr>
<tr>
<td>LB 274</td>
<td>Physics II</td>
<td>4</td>
</tr>
</tbody>
</table>

(5) Delete item 3. f.

(6) Reletter item 3. g. to 3. f. and make the following change items 3. f. (1) and 3. f. (2):

Delete the following courses:
- ZOL 408 Histology
- ZOL 425 Cells and Development (W)

Add the following courses:
- IBIO 408 Histology
- IBIO 425 Cells and Development (W)

(7) Reletter item 3. h. to 3. g.

Effective Fall 2017.

2. Request to establish a Graduate Certificate in Medical Neuroscience in the Program in Neuroscience. The University Committee on Graduate Studies (UCGS) approved this request at its March 14, 2016 meeting.

a. Background Information:

The proposed Graduate Certificate in Medical Neuroscience provides post-baccalaureate credentials and career development for students seeking to improve their academic profile or employment qualifications. The certificate is aimed at students interested in applying to graduate or professional school and individuals working in the pharmaceutical or medical device industries. The health care field is changing with new medical research advancing scientific knowledge at a rapid pace, and the program aims at helping students to navigate developments in the field of neuroscience.

Admission to graduate or professional schools has become a complex and highly competitive process. Changes to admission exams, like the MCAT, shifts focus from testing what the applicants know to testing how they apply and use what they know. This certificate program will give students the skills to think critically, work in teams, and communicate effectively, all important skills necessary for success in graduate school, professional school, or industry.

A review of academic enhancing post-baccalaureate certificate programs targeted to individuals interested in graduate or professional schools found only one other fully-online program. As an online program, the certificate provides students the opportunity to further their education while having the flexibility to gain additional volunteer and/or shadowing experiences or continue in their current professional role without a strict course schedule.

By obtaining the Graduate Certificate in Medical Neuroscience, students will be able to obtain and apply knowledge of topics including nervous system disorders; drug use; abuse, and interactions; neurotechnologies; brain interventions; general neuroscience principles; development; working successfully in team-based settings; analyzing and interpreting data from published peer-reviewed papers; assessing ethical, legal, and social implications of neuroscientific research; tools, and discoveries; and effectively and accurately communicating scientific findings. These educational objectives align with the learning goals set by the university, specifically the goals associated with analytical thinking, effective citizenship, effective communication, and integrated reasoning.
b. **Academic Programs Catalog Text:**

The Graduate Certificate in Medical Neuroscience is aimed at students who are currently working in the pharmaceutical or medical device industries interested in applying to graduate or professional school. It provides post-baccalaureate credentials and career development for students seeking to improve their academic profile or employment qualifications meeting the needs of both working professionals and full-time students. The certificate is available online only.

**Admission**

To be considered for admission to the Graduate Certificate in Medical Neuroscience, students must:

1. have a bachelor’s degree in a biological science background.
2. have a minimum cumulative undergraduate grade-point average of 2.5.
3. write a reflective essay describing how the certificate will enhance their professional and personal development.

**Requirements for the Graduate Certificate in Medical Neuroscience**

Students must complete a minimum of 12 credits from the following courses:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>NEU 841</td>
<td>Medical Neuroscience</td>
<td>3</td>
</tr>
<tr>
<td>NEU 846</td>
<td>Neurobiology of Nervous System Disorders</td>
<td>3</td>
</tr>
<tr>
<td>NEU 842</td>
<td>Neuroethics</td>
<td>3</td>
</tr>
<tr>
<td>NEU 843</td>
<td>Methods for Assessing the Nervous System</td>
<td>2</td>
</tr>
<tr>
<td>NEU 844</td>
<td>The Science and Ethics of Brain Interventions</td>
<td>2</td>
</tr>
<tr>
<td>NEU 847</td>
<td>Development of the Nervous System</td>
<td>3</td>
</tr>
<tr>
<td>PHM 431</td>
<td>Pharmacology of Drug Addiction</td>
<td>3</td>
</tr>
</tbody>
</table>

Effective Spring 2017.

3. Request to change the administrative responsibility for the **Bachelor of Science** degree in **Environmental Geosciences** in the Department of Geological Sciences to the Department of Earth and Environmental Sciences. This department name change was effective July 1, 2016.

Effective Fall 2017.

4. Request to change the administrative responsibility for the **Bachelor of Science** degree in **Geological Sciences** in the Department of Geological Sciences to the Department of Earth and Environmental Sciences. This department name change was effective July 1, 2016.

Effective Fall 2017.

5. Request to change the administrative responsibility for the **Master of Science** degree in **Environmental Geosciences** in the Department of Geological Sciences to the Department of Earth and Environmental Sciences. This department name change was effective July 1, 2016.

Effective Fall 2017.

6. Request to change the administrative responsibility for the **Doctor of Philosophy** degree in **Environmental Geosciences** in the Department of Geological Sciences to the Department of Earth and Environmental Sciences. This department name change was effective July 1, 2016.

Effective Fall 2017.
7. Request to change the administrative responsibility for the Doctor of Philosophy degree in Environmental Geosciences-Environmental Toxicology in the Department of Geological Sciences to the Department of Earth and Environmental Sciences. This department name change was effective July 1, 2016. Effective Fall 2017.

8. Request to change the administrative responsibility for the Master of Science degree in Geological Sciences in the Department of Geological Sciences to the Department of Earth and Environmental Sciences. This department name change was effective July 1, 2016. Effective Fall 2017.

9. Request to change the administrative responsibility for the Doctor of Philosophy degree in Geological Sciences in the Department of Geological Sciences to the Department of Earth and Environmental Sciences. This department name change was effective July 1, 2016. Effective Fall 2017.
PART II - NEW COURSES AND CHANGES

COLLEGE OF AGRICULTURE AND NATURAL RESOURCES

ANS 111  Livestock Industries Seminar
Fall of every year. 1(1-0) R: Open to students in the Institute of Agricultural Technology.
NEW Academic and career planning and professional development in the animal agriculture industry.
Effective Fall 2016

ANS 115  Meats Technology Clerkship
Fall of every year. Spring of every year. 3(0-6) R: Open to students in the Institute of Agricultural Technology.
NEW Hands-on experience in meat production; HACCP; facility maintenance and sanitation; personnel management.
Request the use of the Pass-No Grade (P-N) system.
Effective Fall 2016

ANS 151  Poultry Production Clerkship
Fall of every year. 2(0-4) R: Open to students in the Institute of Agricultural Technology.
NEW Hands-on experience in poultry production, including nutrition, health, and reproduction; housing; records and personnel management.
Request the use of the Pass-No Grade (P-N) system.
Effective Fall 2016

ANS 162  Sheep Production Clerkship
Spring of every year. 2(0-4) R: Open to students in the Institute of Agricultural Technology.
NEW Hands-on experience in sheep production, including nutrition, health, and reproduction; housing; records and personnel management; environmental management.
Request the use of the Pass-No Grade (P-N) system.
Effective Fall 2016

FSC 211  Principles of Food Science
Fall of every year. Spring of every year. Summer of every year. 3(3-0)
Scientific principles, historical perspective, and current status of technology related to food composition, safety, toxicology, processing, preservation, and distribution.
Effective Fall 2014 Effective Summer 2016

FSC 401  Food Chemistry
Fall of every year. Spring of every year. 3(3-0) P: BMB 200 or CEM 352 or (BMB 401 or concurrently) R: Not open to freshmen or sophomores.
Organic and biological reactions of food constituents. Chemical changes in foods during processing and storage affecting texture, color, flavor, stability, and nutritive qualities.
Effective Fall 2014 Effective Spring 2016

FSC 402  Food Chemistry Laboratory
Fall of every year. Spring of every year. 1(0-3) P: (FSC 401 or concurrently) and completion of Tier I writing requirement
Chemical changes in food constituents which affect stability of food products and properties such as color, flavor and texture.
Effective Fall 2014 Effective Spring 2016

FOR 406  Applied Forest Ecology: Silviculture
Fall of every year. 3(3-0) P: ((FOR 404 or concurrently) or (ZOL 355 or concurrently)) and completion of Tier I writing requirement P: ((FOR 404 or concurrently) or (IBIO 355 or concurrently)) and completion of Tier I writing requirement R: Not open to freshmen or sophomores.
Effective Fall 2013 Effective Fall 2016
CSS 192  Professional Development Seminar I  
Fall of every year. Spring of every year. 1(0-2) R: Open to students in the Department of Plant, Soil and Microbial Sciences.
Career development, critical issues analysis, resume writing, scientific presentations and public speaking in crop and soil sciences. Request the use of the Pass-No Grade (P-N) system. 
Effective Spring 2014 Effective Fall 2016

CSS 451  Biotechnology Applications for Plant Breeding and Genetics  
Spring of every year. 3(2-2) Interdepartmental with Forestry and Horticulture. P: CSS 350 or ZOL 341 P: CSS 350 or IBIO 341 R: Open to juniors or seniors or graduate students.
Principles, concepts, and techniques of agricultural plant biotechnology. Recombinant DNA technology, plant molecular biology and transformation in relation to plant improvement. 
Effective Spring 2014 Effective Fall 2016

COLLEGE OF HUMAN MEDICINE

EPI 240  Epidemiological Investigations in Nutrition and Health  
Summer of every year. 3(3-0) Interdepartmental with Human Nutrition and Foods. P: (HNF 150 or concurrently) or (HNF 260 or concurrently) or approval of department P: HNF 150 or concurrently or approval of department
Integration of epidemiology with human nutrition concepts to understand the role of dietary intake and nutritional status as determinants of health-related issues in populations. 
Effective Summer 2014 Effective Fall 2016

EPI 880  Select Topics in Biostatistics  
Summer of every year. 3(3-0) A student may earn a maximum of 9 credits in all enrollments for this course. P: (EPI 808B) or (EPI 808 and EPI 809) or (PHM 830 or STT 464) RB: EPI 808 and EPI 809 for graduate students in the Department of Epidemiology and Biostatistics. PHM 830 or STT 464 or equivalent. R: Approval of department. R: Open to graduate students in the Department of Epidemiology and Biostatistics or approval of department.
Select topics in biostatistics including global disease distribution and estimation, causal inference, Bayesian methods in health services research. 
Effective Summer 2012 Effective Summer 2017

COLLEGE OF NATURAL SCIENCE

BLD 811  Fundamentals of Scientific Research  
Fall of every year. Spring of every year. 1(1-0) R: Open to master's students in the Biomedical Laboratory Diagnostics Program.
Best practices for the research enterprise. Ethical conduct of research. Critical evaluation of scientific literature. SA: MT 810 
Effective Summer 2014 Effective Fall 2016

BLD 815  Cell Biology in Health and Disease I  
Spring of every year. 2(2-0) RB: Undergraduate course in Biochemistry and Physiology. 
Experience in a clinical laboratory
Principles and theories of cell biology and biochemistry are presented with a focus on applications to clinical pathology. Request the use of ET-Extension to postpone grading.
The work for the course must be completed and the final grade reported within 4 semesters after the end of the semester of enrollment. 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 2008 Effective Fall 2016
BLD 816  Cell Biology in Health and Disease II  
Summer of every year. 2(2-0) P: BLD 815 RB: Undergraduate course in biochemistry and physiology. Experience in a clinical laboratory  
Continuation of BLD 815.  
Request the use of ET-Extension to postpone grading.  
**The work for the course must be completed and the final grade reported within 4 semesters after the end of the semester of enrollment.**  
Effective Summer 2009 Effective Fall 2016

BLD 831  Clinical Application of Molecular Biology  
Spring of every year. Summer of every year. 2(2-0) P: BLD 830 RB: Basic biochemistry, medical or research laboratory experience  
Molecular diagnostic principles. Diagnostic outcomes in traditional and non-traditional laboratory disciplines.  
Request the use of ET-Extension to postpone grading.  
**The work for the course must be completed and the final grade reported within 2 semesters after the end of the semester of enrollment.**  
Effective Fall 2008 Effective Fall 2016

BLD 832  Molecular Pathology Laboratory  
Summer of every year. 2(0-4) P: BLD 831 or concurrently  
Equipment operation, DNA extraction and measurement, electrophoresis, hybridization and transfers, amplification and detection including techniques and automated sequencing. Clinical applications.  
Request the use of ET-Extension to postpone grading.  
**The work for the course must be completed and the final grade reported within 4 semesters after the end of the semester of enrollment.**  
Effective Summer 2009 Effective Fall 2016

BLD 835  Hemostasis, Thrombosis and Effective Resource Management  
Fall of every year. 3(3-0) RB: Background in hemostasis, thrombosis and blood product management.  
Theories of coagulation, thrombosis and effective blood product management. Needs and particular stresses during an active bleeding crisis.  
Request the use of ET-Extension to postpone grading.  
**The work for the course must be completed and the final grade reported within 4 semesters after the end of the semester of enrollment.**  
Effective Spring 2016 Effective Fall 2016

BLD 850  Concepts in Immunodiagnostics  
Fall of every year. Spring of every year. 2(2-0) RB: An undergraduate course in biochemistry or cell biology.  
Immunology principles and theory applied to diagnostic evaluation of the host immune response during health and disease.  
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 2008 Effective Fall 2016
BLD 851  Clinical Application of Immunodiagnostic Principles  
Spring of every year. Summer of every year. 2(2-0) P: BLD 850  
Immunodiagnostic theories and principles applied to clinical assay development and  
method evaluation.  
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. The work for the course must be  
completed and the final grade reported within 3 semesters after the end of the semester of  
enrollment.  
SA: MT 851  
Effective Summer 2008 Effective Fall 2016  

BLD 852  Immunodiagnostics Laboratory  
Summer of every year. 2(2-0) P: BLD 850  
Performance of immunopurifications, in vitro diagnostic assays and basic flow cytometry.  
Data analysis and quality control evaluation.  
Request the use of ET-Extension to postpone grading.  
The work for the course must be completed and the final grade reported within 4  
semesters after the end of the semester of enrollment. 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 2008 Effective Fall 2016  

BLD 853  Advanced Flow Cytometry  
Summer of every year. 2(2-0) P: BLD 850 and BLD 851 and (BLD 852 or concurrently) or approval  
of department  
Flow cytometry systems, software and reagents. Data analysis and experimental design  
of complex flow cytometric assays. Flow cytometry applications in medicine and research.  
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. 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 2014 Effective Fall 2016  

ES 800  Special Problems in Earth Science  
Fall of every year. Spring of every year. Summer of every year. On Demand. 1 to 4 credits. A  
student may earn a maximum of 12 credits in all enrollments for this course. R: Approval of  
department. R: Open to graduate students. Approval of department.  
Individual faculty directed study on topics in earth science.  
Effective Spring 1993 Effective Fall 2017  

GLG 201  The Dynamic Earth  
Fall of every year. Spring of every year. 4(3-2) Not open to students with credit in GLG 301.  
Physical and chemical processes related to the past, present and future behavior of the  
earth system, and the energy systems that drive these processes. A study of the earth’s  
materials, the earth’s surface and the earth’s interior.  
Effective Fall 2014 Effective Fall 2017
GLG 202  Geology of Michigan
Fall of every year. 3(2-2) P: Completion of Tier I Writing Requirement R: Not open to students in the Department of Geological Sciences or in the Lyman Briggs Earth Science Major or in the Lyman Briggs Environmental Geosciences Coordinate Major or in the Lyman Briggs Geological Sciences Coordinate Major. R: Not open to students in the Department of Earth and Environmental Sciences or in the Lyman Briggs Earth Science Major or in the Lyman Briggs Earth Science; Interdepartmental Coordinate Major or in the Lyman Briggs Environmental Geosciences Coordinate Major or in the Lyman Briggs Geological Sciences Coordinate Major. Not open to students with credit in GLG 304 or GLG 201.
Integration of the geological evolution of Michigan with its social and economic development. Field trips are required.
SA: GLG 202
Effective Summer 2015 Effective Fall 2017

GLG 301  Geology of Continents and Oceans
Geology of the Great Lakes Region
Spring of every year. 3(3-0) P: MTH 132 or LB 118 or MTH 152H P: (PHY 231 or PHY 183 or LB 273 or PHY 193H) and (CEM 141 or CEM 151 or LB 171 or CEM 181H) RB: Physical science, environmental engineering, civil engineering R: Open to undergraduate students in the Department of Civil and Environmental Engineering. Not open to students with credit in GLG 201.
Effective Summer 2015 Effective Fall 2017

GLG 304  Physical and Biological History of the Earth
Spring of every year. 4(3-2) P: GLG 201 or ISP 203A
SA: GLG 202
Effective Fall 2014 Effective Fall 2017

GLG 321  Mineralogy and Geochemistry
Fall of every year. 4(3-2) P: GLG 201 and (CEM 142 or CEM 152 or CEM 182H or LB 172) and (MTH 132 or MTH 152H or LB 118)
Earth materials and their origin, modification, structure, dynamics and history. Crystallography and crystal chemistry, and geochemical properties and processes in mineral crystallization and recrystallization. Analytical identification and characterization of minerals in their lithologic context.
Effective Fall 2014 Effective Fall 2017

GLG 361  Igneous and Metamorphic Geochemistry and Petrology
Spring of every year. 4(3-2) P: GLG 321
Evolution, origin, occurrence and tectonic setting of igneous and metamorphic rocks. Phase relations of igneous and metamorphic systems. Studies of rocks in thin sections. Field trip required.
SA: GLG 461
Effective Summer 2015 Effective Fall 2017
GLG 401  Global Tectonics and Earth Structure (W)
Fall of every year. 4(3-2) P: ((GLG 304) and completion of Tier I writing requirement) and (MTH 114 or
MTH 116 or MTH 124 or MTH 132 or MTH 152H or LB 118) and (PHY 183 or PHY 183B or
PHY 231 or PHY 231C or LB 273 or PHY 193H) R: Open to seniors or graduate students.
Structural geology, geological and geophysical methods of studying the structure and
dynamics of the earth and planets. Plate kinematics and global geodynamic processes,
plate margin processes and evolution, marine geology. Field trip required.
SA: GLG 371

Effective Fall 2014 Effective Fall 2017

GLG 411  Hydrogeology
Fall of every year. 3(3-0) RB: MTH 114 or MTH 116 or MTH 124 or MTH 126 or MTH 132 or MTH
133 or LB 118 or LB 119 or MTH 152H or MTH 153H R: Not open to freshmen or sophomores.
Source, occurrence, and movement of groundwater emphasizing geologic factors and
controls.

Effective Fall 2014 Effective Fall 2017

GLG 412  Glacial Geology and the Record of Climate Change
Spring of every year. 3(3-0) 4(3-2) Interdepartmental with Geography. RB: GLG 201 or GEO 306 or
GEO 408 or GLG 301 R: Not open to freshmen or sophomores.
In-depth analysis of glacial geology and the record of climate change, with emphasis on
North America and Europe. Field trip required.

Effective Fall 2014 Effective Spring 2018

GLG 421  Environmental Geochemistry
Spring of every year. 4(3-2) RB: GLG 201 and (CEM 141 or CEM 151 or CEM 181H or LB 171)
Natural and anthropogenic processes affecting the chemistry of the environment with an
emphasis on the water cycle. Equilibria and kinetic balances, biogeochemical cycling,
contaminant chemicals, chemical origins, environmental health.

Effective Fall 2014 Effective Fall 2017

GLG 431  Sedimentology and Stratigraphy
Spring of every year. 4(3-2) P: GLG 321 P: GLG 321 and GLG 304
Sediments, sedimentary rocks, sedimentary processes, and depositional environments
through geologic time. Facies event correlation. Fossils as tools in stratigraphy and
environmental analysis. Biostratigraphy, paleoecology and taphonomy. Field trip required.

Effective Fall 2014 Effective Fall 2017

GLG 433  Vertebrate Paleontology
Fall of even years. 4(3-2) Interdepartmental with Integrative Biology. P: IBIO 328 or GLG 304 or
IBIO 360 or IBIO 365 or IBIO 384 or IBIO 445 or GLG 434 or FW 471
Fossil vertebrates with emphasis on evolution and interrelationships of major groups.
Modern techniques of identification and interpretation of fossils.

Effective Fall 2014 Effective Fall 2017

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

Effective Fall 2014 Effective Fall 2017

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

Effective Fall 2014 Effective Fall 2017
GLG 440  Planetary Geology
Spring of every year. 3(2-2) P: GLG 201 and GLG 304 and GLG 321 or approval of department RB: (PHY 232 or PHY 184 or PHY 294H or LB 274) and (MTH 132 or MTH 152H or LB 118)
Surficial and internal properties and processes of planets and their natural satellites, asteroids, comets, and meteorites. Origin, composition, structure, tectonics, volcanism, impact phenomena, atmospheric evolution, atmosphere-surface interactions, and history of solar system bodies. Results of recent space exploration programs, projects and missions. Effective Fall 2014 Effective Fall 2017

GLG 446  Ecosystems Modeling, Water and Food Security
Fall of every year. 3(3-0) 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 efficiency of natural resources use. Effective Fall 2016 Effective Fall 2017

GLG 470  Solid Earth Geophysics and Geodynamics
Spring of odd years. 3(0-3) P: GLG 201 and (MTH 133 or LB 119 or MTH 153H) and (PHY 183 or PHY 183B or PHY 193H or PHY 233B or LB 273) RB: (MTH 234 or concurrently) or (LB 220 or concurrently) or (MTH 254H or concurrently)
Theory and applications of solid-earth geophysics including geochronology, geothermics, geomagnetism and paleomagnetism, geodesy and gravity, rheology, and seismology. SA: GLG 472 Effective Summer 2015 Effective Fall 2017

GLG 471  Applied Geophysics
Spring of every year. 4(3-2) P: ((MTH 133 or concurrently) or (LB 119 or concurrently) or (MTH 153H or concurrently)) and ((PHY 184 or concurrently) or (PHY 184B or concurrently) or (PHY 232 or concurrently) or (PHY 232C or concurrently) or (PHY 294H or concurrently) or (LB 274 or concurrently)) R: Not open to freshmen or sophomores.
Application of seismic, gravity, magnetic, resistivity, and electromagnetic methods to problems related to engineering studies, mineral and oil exploration, groundwater, subsurface mapping, pollution, and hazardous waste. Effective Fall 2014 Effective Fall 2017

GLG 481  Reservoirs and Aquifers
Spring of odd years. 3(2-2) P: GLG 431 or concurrently
Principles of the origin and evolution of porous media. Porosity and permeability of sediments and sedimentary rocks. Computing techniques for evaluating reservoirs and aquifers. Field trip required. Effective Fall 2014 Effective Fall 2017

GLG 491  Field Geology - Summer Camp (W)
Summer of every year. 6 credits. P: (GLG 431 and GLG 361) or (GLG 431 and GLG 401) or ((GLG 361 and GLG 401) and completion of Tier I writing requirement) R: Open to students in the Department of Geological Sciences or in the Lyman Briggs Geological Sciences Coordinate Major or in the Lyman Briggs Environmental Geosciences Coordinate Major. Approval of department. Field analysis of rock types: igneous, metamorphic, sedimentary. Structural analysis. Preparation of stratigraphic sections, geologic maps and cross sections. Air photo analysis. Effective Fall 2014 Effective Fall 2017
GLG 493  
Field Studies in Geological Sciences  
On Demand. 1 to 6 credits. A student may earn a maximum of 8 credits in all enrollments for this course. P: GLG 201 and GLG 304 RB: Specific programs may have additional prerequisites. R: Open to juniors or seniors or graduate students in the Department of Geological Sciences or in the Lyman Briggs Environmental Geosciences Coordinate Major or in the Lyman Briggs Geological Sciences Coordinate Major. Approval of department.  
Field experiences in solid earth and environmental geosciences within the US and abroad. Field trips required. Request the use of ET-Extension to postpone grading. The work for the course must be completed and the final grade reported within 1 semester after the end of the semester of enrollment.  
Effective Summer 2016 Effective Fall 2017

GLG 498  
Topics in Geological Sciences  
On Demand. 1 to 4 credits. A student may earn a maximum of 8 credits in all enrollments for this course. P: GLG 201 and GLG 304 or approval of department R: Open to juniors or seniors or graduate students in the Department of Geological Sciences or in the Lyman Briggs Environmental Geosciences Coordinate Major or in the Lyman Briggs Geological Sciences Coordinate Major.  
Selected topics in geological and geoenvironmental sciences supplementing or expanding specific topics, or examining topics not covered in regular courses. 
Effective Spring 2016 Effective Fall 2017

GLG 499  
Independent Study in Geological Sciences  
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 seniors or juniors in the Department of Geological Sciences or in the Lyman Briggs Earth Science-Interdepartmental Coordinate Major or in the Lyman Briggs Environmental Geosciences Coordinate Major or in the Lyman Briggs Geological Sciences Coordinate Major. Approval of department; application required.  
Advanced individual study of special topics in the geological sciences.  
Effective Fall 2014 Effective Fall 2017

GLG 801  
Seminar in Geochemistry  
Fall of every year. Spring of every year. On Demand. 1 to 4 credits. A student may earn a maximum of 9 credits in all enrollments for this course. R: Open only to graduate students in the Department of Geological Sciences. R: Open to graduate students in the Department of Earth and Environmental Sciences.  
Recent developments in geochemistry, including aqueous, biologic and mineralogic aspects.  
Effective Spring 2001 Effective Fall 2017

GLG 802  
Seminar in Geophysics and Geodynamics  
Fall of every year. Spring of every year. 1 to 4 credits. A student may earn a maximum of 9 credits in all enrollments for this course. RB: GLG 401 or GLG 470 or GLG 471 R: Open only to graduate students in the Department of Geological Sciences. R: Open to graduate students in the Department of Earth and Environmental Sciences.  
Applied, solid-earth, and theoretical geophysics, global and regional geodynamics. Plate tectonics, marine geophysics, and polar earth sciences.  
Effective Fall 2004 Effective Fall 2017

GLG 803  
Seminar in Hydrogeology  
Fall of every year. Spring of every year. 1 to 4 credits. A student may earn a maximum of 9 credits in all enrollments for this course. RB: GLG 411 or GLG 421 R: Open only to graduate students in the Department of Geological Sciences. R: Open to graduate students in the Department of Earth and Environmental Sciences.  
Occurrence, movement and composition of groundwater in geologic settings.  
Effective Fall 1999 Effective Fall 2017
GLG 804  Seminar in Paleobiology  
**Fall of every year. Spring of every year. On Demand. 1 to 4 credits. A student may earn a maximum of 9 credits in all enrollments for this course.**  
R: Open only to graduate students in the Department of Geological Sciences.  
R: Open to graduate students in the Department of Earth and Environmental Sciences.  
- Invertebrate, vertebrate and plant paleobiology.  
**Effective Fall 2000 Effective Fall 2017**

GLG 805  Seminar in Petrology  
**Fall of every year. Spring of every year. 1 to 4 credits. A student may earn a maximum of 9 credits in all enrollments for this course.**  
RB: GLG 361  
R: Open only to graduate students in the Department of Geological Sciences.  
R: Open to graduate students in the Department of Earth and Environmental Sciences.  
- Current topics in igneous petrology.  
**Effective Fall 2001 Effective Fall 2017**

GLG 806  Seminar in Sedimentology and Stratigraphy  
**Fall of every year. Spring of every year. On Demand. 1 to 4 credits. A student may earn a maximum of 9 credits in all enrollments for this course.**  
R: Open only to graduate students in the Department of Geological Sciences.  
R: Open to graduate students in the Department of Earth and Environmental Sciences.  
- Recent developments in stratigraphy and deposition, and diagenesis of sedimentary rocks.  
**Effective Summer 1994 Effective Fall 2017**

GLG 807  Seminar in Structural Geology and Tectonics  
**Fall of every year. Spring of every year. On Demand. 1 to 4 credits. A student may earn a maximum of 9 credits in all enrollments for this course.**  
R: Open only to graduate students in the Department of Geological Sciences.  
R: Open to graduate students in the Department of Earth and Environmental Sciences.  
- Rock deformation and major lithospheric structure.  
**Effective Fall 1992 Effective Fall 2017**

GLG 808  Seminar in Planetary Geology and Astromaterials  
**Fall of every year. Spring of every year. 1 to 4 credits. A student may earn a maximum of 9 credits in all enrollments for this course.**  
RB: Upper university-level coursework in GLG or AST.  
R: Open to graduate students in the Department of Earth and Environmental Sciences. Approval of department.  
- Current topics in planetary geology and astromaterials, including meteorites and returned samples.  
**Effective Spring 2008 Effective Fall 2017**

GLG 813  Hillslope Hydrology  
**Spring of every year. 4(3-1)**  
Advanced course on Hillslope Hydrology covering the physical, chemical, and isotopic characteristics of river runoff generation from the pore to the catchment scale.  
**Effective Spring 2017 Effective Fall 2017**

GLG 821  Aqueous Geochemistry  
**Fall of odd years. 3(2-2)**  
RB: CE 481 or CEM 383 or CSS 455 or FW 472 or GLG 421 or GLG 422  
R: Open only to graduate students.  
- Controls on the chemical and isotopic nature of water (fresh, marine, brine) and its solutes. Data acquisition and synthesis. Chemical modeling and evolution of water masses.  
**Effective Fall 1996 Effective Fall 2017**

GLG 862  Igneous Petrology  
**Fall of even years. 4(3-2)**  
RB: GLG 361  
R: Open to graduate students.  
- Origin and evolution of magmatic systems. Relationship of igneous activity to tectonic setting.  
**Effective Fall 2009 Effective Fall 2017**
GLG 889 Special Problems in Geocognition
Fall of every year. Spring of every year. Summer of every year. 1 to 4 credits. A student may earn a maximum of 9 credits in all enrollments for this course.
Individual study on current problems in geocognition and geoscience education research
Effective Summer 2016 Effective Fall 2017

GLG 890 Special Problems in Planetary Geology and Astromaterials
Fall of every year. Spring of every year. 1 to 4 credits. A student may earn a maximum of 6 credits in all enrollments for this course. RB: Upper university-level coursework in GLG or AST. R: Open to graduate students in the Department of Geological Sciences. Approval of department. R: Open to graduate students in the Department of Earth and Environmental Sciences. Approval of department.
Individual study on current topics in planetary geology and astromaterials, including meteorites and returned samples.
Effective Spring 2008 Effective Fall 2017

GLG 891 Special Problems in Geochemistry
Fall of every year. Spring of every year. Summer of every year. On Demand. 1 to 4 credits. A student may earn a maximum of 6 credits in all enrollments for this course. R: Open only to graduate students in the Department of Geological Sciences. Approval of department. R: Open to graduate students in the Department of Earth and Environmental Sciences. Approval of department.
Individual study on problems in geochemistry, including aqueous, biologic, and mineralogic aspects.
Effective Fall 1992 Effective Fall 2017

GLG 892 Special Problems in Geophysics and Geodynamics
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. RB: GLG 401 or GLG 470 or GLG 471 R: Open only to graduate students in the Department of Geological Sciences. Approval of department. R: Open to graduate students in the Department of Earth and Environmental Sciences. Approval of department.
Individual study on problems in applied and solid-earth geophysics, global and regional geodynamics, and polar earth sciences.
Effective Fall 2001 Effective Fall 2017

GLG 893 Special Problems in Hydrogeology
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. RB: GLG 411 or GLG 421 R: Open only to graduate students in the Department of Geological Sciences. Approval of department. R: Open to graduate students in the Department of Earth and Environmental Sciences. Approval of department.
Individual study on the movement, occurrence and composition of groundwater in geologic environments.
Effective Fall 1995 Effective Fall 2017

GLG 894 Special Problems in Paleobiology
Fall of every year. Spring of every year. Summer of every year. On Demand. 1 to 4 credits. A student may earn a maximum of 6 credits in all enrollments for this course. RB: Open only to graduate students in the Department of Geological Sciences. Approval of department. R: Open to graduate students in the Department of Earth and Environmental Sciences. Approval of department.
Individual study on invertebrate, vertebrate and plant paleobiology.
Effective Summer 1994 Effective Fall 2017

GLG 895 Special Problems in Petrology
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. RB: GLG 361 R: Open only to graduate students in the Department of Geological Sciences. Approval of department. R: Open to graduate students in the Department of Earth and Environmental Sciences. Approval of department.
Individual study on current problems in petrology.
Effective Fall 2001 Effective Fall 2017
GLG 896  Special Problems in Sedimentology and Stratigraphy
Fall of every year. Spring of every year. Summer of every year. On Demand. 1 to 4 credits. A student may earn a maximum of 6 credits in all enrollments for this course. R: Open only to graduate students in the Department of Geological Sciences. Approval of department. R: Open to graduate students in the Department of Earth and Environmental Sciences. Approval of department.
Individual study on problems in sedimentology and stratigraphy.
Effective Fall 2000 Effective Fall 2017

GLG 897  Special Problems in Structural Geology and Tectonics
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. RB: GLG 351 R: Open only to graduate students in the Department of Geological Sciences. Approval of department. R: Open to graduate students in the Department of Earth and Environmental Sciences. Approval of department.
Individual study on rock deformation or major expressions of deformation. From two to seven weeks of field study during semester breaks may be required for certain research projects.
Effective Fall 1996 Effective Fall 2017

GLG 898  Special Problems in Environmental Geosciences
Fall of every year. Spring of every year. Summer of every year. On Demand. 1 to 4 credits. A student may earn a maximum of 6 credits in all enrollments for this course. R: Open only to graduate students in the Department of Geological Sciences. Approval of department. R: Open to graduate students in the Department of Earth and Environmental Sciences. Approval of department.
Individual study on problems in environmental geosciences.
Effective Fall 1994 Effective Fall 2017

GLG 899  Master's Thesis Research
Fall of every year. Spring of every year. Summer of every year. On Demand. 1 to 10 credits. A student may earn a maximum of 36 credits in all enrollments for this course. R: Open only to master's students in the Department of Geological Sciences. Approval of department. R: Open to master's students in the Department of Earth and Environmental Sciences. Approval of department.
Master's thesis research.
Request the use of ET-Extension to postpone grading.
The work for the course must be completed and the final grade reported within 1 semester after the end of the semester of enrollment.
Effective Summer 2002 Effective Fall 2017

GLG 901  Research Strategies and Methods
Fall of every year. Spring of every year. Summer of every year. 1(1-0) A student may earn a maximum of 3 credits in all enrollments for this course. RB: Undergraduate degree in Engineering or Sciences
Selected topics in the earth and environmental sciences.
Request the use of the Pass-No Grade (P-N) system.
Effective Fall 2011 Effective Fall 2017

GLG 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 Geological Sciences. Approval of department. R: Open to doctoral students in the Department of Earth and Environmental Sciences. Approval of department.
Doctoral dissertation research.
Request the use of the Pass-No Grade (P-N) system.
Effective Summer 2014 Effective Fall 2017
IBIO 492  Interdisciplinary Studies in Conservation Medicine
Spring of every year. Abroad 4(4-0) P: (BS 161 and BS 162) or (BS 181H and BS 182H) or (LB 144 and LB 145) R: Approval of department.
NEW  Interdisciplinary studies focused on "health" as defined by the interactions of animal health, ecosystem health, and human health, viewed through the lens of human culture. Request the use of ET-Extension to postpone grading. The work for the course must be completed and the final grade reported within 1 semester after the end of the semester of enrollment. Effective Spring 2017

IBIO 492L  Advanced Research Applications in Conservation Medicine
Spring of every year. Abroad 4(0-12) P: (BS 161 and BS 162) or (BS 181H and BS 182H) or (LB 144 and LB 145) R: Approval of department.
NEW  Field and laboratory techniques for assessing and monitoring biodiversity and health of humans, animals, and ecosystems. Tools and techniques will be drawn from ecology, microbiology, molecular biology, genetics, histopathology, bioinformatics and statistics. Request the use of ET-Extension to postpone grading. The work for the course must be completed and the final grade reported within 1 semester after the end of the semester of enrollment. Effective Spring 2017

IBIO 493  International Communications in Conservation Medicine (W)
Spring of every year. 4(4-0) P: ((BS 161 and BS 162) and completion of Tier I writing requirement) or ((BS 181H and BS 182H) and completion of Tier I writing requirement) or ((LB 144 and LB 145) and completion of Tier I writing requirement)
NEW  Development of communication skills (written and oral) to convey scientific information to scientists, health professionals, general public, and indigenous communities. Request the use of ET-Extension to postpone grading. The work for the course must be completed and the final grade reported within 1 semester after the end of the semester of enrollment. Effective Spring 2017

MTH 101  Quantitative Literacy I
Fall of every year. 3 credits. P: (MTH 1825) or designated score on Mathematics Placement test P: (MTH 1825 or MTH 103) or designated score on Mathematics Placement test
Quantitative literacy including applications to health and risk, science, and the environment. Effective Fall 2015 Effective Summer 2016

MTH 102  Quantitative Literacy II
Spring of every year. 3 credits. P: (MTH 1825) or designated score on Mathematics Placement test P: (MTH 1825 or MTH 103) or designated score on Mathematics Placement test
Quantitative literacy including applications to finance, economics, and politics. Effective Spring 2016 Effective Summer 2016

MTH 309  Linear Algebra I
Fall of every year. Spring of every year. Summer of every year. 3(3-0) P: ((MTH 133 or MTH 153H or LB 119) and completion of Tier I writing requirement) and (MTH 299 or approval of department) Not open to students with credit in MTH 317H.
Matrices, systems of linear equations, vector spaces, linear transformations, inner products and orthogonal spaces, eigenvalues and eigenvectors, and applications to geometry. A writing course with emphasis on proofs. Effective Fall 2013 Effective Fall 2017

MTH 310  Abstract Algebra I and Number Theory
Fall of every year. Spring of every year. Summer of every year. 3(3-0) P: ((MTH 299 or MTH 317H) or approval of department) and completion of Tier I writing requirement Not open to students with credit in MTH 418H.
Structure of the integers, congruences, rings, ring homomorphisms, ideals, quotient rings. A writing course with an emphasis on proofs. Effective Fall 2013 Effective Spring 2017
MTH 317H  Honors Linear Algebra
Fall of every year. Spring of every year. 4(5-0) P: MTH 133 or MTH 153H or LB 119 R: Open to students in the Honors College or approval of department. Not open to students with credit in MTH 309. Systems of equations, matrix algebra, vector spaces, linear transformations, geometry of $\mathbb{R}^n$, eigenvalues, eigenvectors, diagonalization, inner products. Emphasis on mathematical reasoning, proofs, and concepts. Effective Fall 2013 Effective Fall 2017

MTH 411  Abstract Algebra II
Fall of every year. Spring of every year. 3(3-0) P: MTH 310 Not open to students with credit in MTH 418H. Not open to students with credit in MTH 419H. Continuation of MTH 310. Permutation groups, groups of transformations, normal subgroups, homomorphism theorems, modules. Principal ideal rings, unique factorization domains, noncommutative rings, rings of fractions, ideals. Effective Summer 2015 Effective Spring 2017

NEU 841  Medical Neuroscience
Fall of every year. 3(3-0) RB: Undergraduate degree in the biological sciences Not open to students with credit in NEU 839. NEW Detailed survey of nervous system structure and function with an emphasis on medical applications Effective Fall 2016

NEU 842  Neuroethics
Summer of every year. 3(3-0) RB: (NEU 840 or concurrently) or (NEU 841 or concurrently) NEW Introduction to the field of neuroethics and the responsible application of advances in neuroscience research. Effective Summer 2017

NEU 843  Methods for Assessing the Nervous System
Spring of every year. 2(2-0) RB: (NEU 840 or concurrently) or (NEU 841 or concurrently) NEW An introduction to the various techniques and methods scientists use to study brain structure and function. Effective Spring 2017

NEU 844  The Science and Ethics of Brain Interventions
Summer of every year. 2(2-0) RB: (NEU 840 or concurrently) or (NEU 841 or concurrently) NEW Introduction to cognitive enhancement to improve intellect and cognition, and legal and ethical implications of this. Effective Summer 2017

NEU 846  Neurobiology of Nervous System Disorders
Spring of every year. 3(3-0) RB: NEU 841 or concurrently NEW An overview of abnormalities that contribute to central nervous system, peripheral nervous system, and psychological diseases and disorders examined at genetic, cellular, and behavioral levels. Effective Spring 2017

NEU 847  Development of the Nervous System
Fall of every year. 3(3-0) RB: NEU 841 or concurrently NEW Introduction to processes involved in the development of the nervous systems and their clinical application Effective Fall 2016
COLLEGE OF OSTEOPATHIC MEDICINE

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

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

OST 688  The Cuban Health Care System & Culture (I)
Fall of every year. Spring of every year. Summer of every year. 3 to 6 credits. A student may earn a maximum of 18 credits in all enrollments for this course. R: Open to graduate-professional students in the College of Osteopathic Medicine.
NEW Primary goal of this 2-week, 4 credit, course is to introduce students to the health care delivery model in Cuba while experiencing the country’s rich culture. Students will explore the public health and community medicine model by on site observation of the delivery of community health clinics, maternal health, pediatric care, and geriatric care. Students will rotate through 3 teaching hospitals in Havana. Includes lectures and presentations by Cuban health care officials and clinicians. Students will observe and participate in the care of patients & learn Cuba’s history & culture. Offered second half of semester.
Request the use of the Pass-No Grade (P-N) system.
Request the use of ET-Extension to postpone grading.
The work for the course must be completed and the final grade reported within 2 semesters after the end of the semester of enrollment.
Effective Spring 2017

COLLEGE OF VETERINARY MEDICINE

LCS 641  Food Animal Theriogenology Clerkship
Summer of every year. 3(3-0) P: LCS 679 RB: Completion of Semester 5 of the graduate-professional program in the College of Veterinary Medicine. R: Open to graduate-professional students in the College of Veterinary Medicine.
NEW Techniques for evaluating the reproductive performance of individual food animals and populations. Primary emphasis on cattle, but other species will be taught including swine and small ruminants.
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 2017
LCS 679  Food Animal Production Medicine I  
Spring of every year. 6 credits, 3 credits. RB: Completion of semester 5 of the graduate-
professional program in the College of Veterinary Medicine R: Open to graduate-professional 
students in the College of Veterinary Medicine. 
Entry-level principles of production medicine as applied to food animal practice.  
**Effective Fall 2013  Effective Spring 2017**