PART I – NEW ACADEMIC PROGRAMS AND PROGRAM CHANGES

COLLEGE OF AGRICULTURE AND NATURAL RESOURCES

1. Request to change the requirements for the Bachelor of Science degree in Forestry in the Department of Forestry.
   a. Under the heading Requirements for the Bachelor of Science Degree in Forestry make the following changes:
      (1) In item 3. a. change the total credits from ‘67’ to ‘68’.
      (2) In item 3. a. delete the following course:
           FOR 340L Forest Ecology Laboratory     1
           Add the following course:
           FOR 340L Forest Ecology Laboratory     2

   Effective Fall 2024.

COLLEGE OF ENGINEERING

1. Request to change the requirements in the Bachelor of Science degree in Computational Data Science in the Department of Computer Science and Engineering.
   a. Under the heading Requirements for the Bachelor of Science Degree in Computational Data Science make the following change:
      (1) In item 3. b. change the total credits from ‘44’ to ‘47’ and add the following course:
           CSE 380 Information Management and the Cloud   3

   Effective Fall 2024.

2. Request to change the requirements in the Bachelor of Science degree in Computer Science in the Department of Computer Science and Engineering. The University Committee on Undergraduate Education (UCUE) will consider this request at its February 8, 2024 meeting.
   The concentrations in the Bachelor of Science degree in Computer Science are noted on the student’s academic record when the requirements for the degree have been completed.
   a. Under the heading Requirements for the Bachelor of Science Degree in Computer Science make the following changes:
      (1) In item 3. b. change the total credits from ‘35’ to ‘32’ and delete the following courses:
           CSE 425 Introduction to Computer Security    3
           MTH 314 Matrix Algebra with Computational Applications 3
           Add the following course:
           CSE 380 Information Management and the Cloud   3
(2) In item 3. b. add the following note:

Students must have a minimum grade of 2.0 in each of the following courses: CSE 300, CSE 320, CSE 325, CSE 331, CSE 335, CSE 380.

(3) Reletter item 3. c. to item 3. d. and item 3. d. to item 3. e. respectively.

(4) Add the following item 3. c.:

c. One of the following courses (3 or 4 credits):
   MTH  314  Matrix Algebra with Computational Applications  3
   MTH  317H  Honors Linear Algebra     4

(5) In item 3. d. add the following course:

CSE  425  Introduction to Computer Security     3

(6) Add the following transcriptable concentrations:

Concentrations in Computer Science
The Department offers the following concentrations to students wishing an area of specialization in their degree. The concentrations are available to, but not required of, any student enrolled in the Bachelor of Science degree program in Computer Science. NOTE: Completing the Bachelor of Science degree in Computer Science with a concentration may require more than 120 credits. Upon completion of the required courses for a concentration, certification will appear on the student’s official transcript. Students may select no more than one concentration.

For any concentration, 3 credits of CSE 499 Undergraduate Research related to the subject area may be applied with approval of the Department of Computer Science and Engineering.

Artificial Intelligence
To complete a Bachelor of Science degree in Computer Science with an artificial intelligence concentration, students must complete the requirements for the bachelor’s degree, including the following:

Two of the following courses (6 credits):
CSE  404  Intro to Machine Learning     3
CSE  440  Introduction to Artificial Intelligence     3
CSE  482  Big Data Analysis     3

Three of the following courses not taken above (9 to 12 credits):
CSE  402  Biometrics and Pattern Recognition     3
CSE  404  Intro to Machine Learning     3
CSE  434  Autonomous Vehicles     3
CSE  440  Introduction to Artificial Intelligence     3
CSE  482  Big Data Analysis     3
CSE  803  Computer Vision     3
ADV  401  Neuromarketing and Consumer Decisions     3
LIN  401  Introduction to Linguistics     4
LIN  424  Introduction to Phonetics and Phonology     3
LIN  427  Laboratory Phonetics     3
LIN  431  Introduction to Morphology     3
LIN  434  Introduction to Syntax     3
LIN  437  Introduction to Semantics and Pragmatics     3
LIN  463  Introduction to Cognitive Science     3
LIN  471  Sociolinguistics     3
MI  484  Human Robot Interaction (W)     3
MTH  468  Predictive Analysis     3
NEU  301  Introduction to Neuroscience I     3
NEU  302  Introduction to Neuroscience II     3
PHL  330  Formal Deductive Reasoning     4
PHL  331  Formal Practical Reasoning     4
PHL  432  Logic and its Metatheory     4
PSY  301  Cognitive Neuroscience     3
Computer Systems
To complete a Bachelor of Science degree in Computer Science with a computer systems concentration, students must complete the requirements for the bachelor’s degree, including the following:
All of the following courses (9 credits):
- CSE 410 Operating Systems 3
- CSE 422 Computer Networks 3
- CSE 450 Translation of Programming Languages 3
Two of the following courses (6 credits):
- CSE 415 Introduction to Parallel Programming 3
- CSE 420 Computer Architecture 3
- CSE 425 Introduction to Computer Security 3
- CSE 434 Autonomous Vehicles 3
- CSE 472 Computer Graphics 3
- CSE 480 Database Systems 3

Cybersecurity
To complete a Bachelor of Science degree in Computer Science with a cybersecurity concentration, students must complete the requirements for the bachelor’s degree, including the following:
All of the following courses (6 credits):
- CSE 402 Biometrics and Pattern Recognition 3
- CSE 425 Introduction to Computer Security 3
Three of the following courses (9 credits):
- CSE 410 Operating Systems 3
- CSE 422 Computer Networks 3
- CSE 431 Algorithm Engineering 3
- CSE 434 Autonomous Vehicles 3
- CSE 480 Database Systems 3
- CSE 482 Big Data Analysis 3
- MI 239 Digital Footprints: Privacy and Online Behavior 3
- MTH 416 Introduction to Algebraic Coding 3

Multimedia and Graphics
To complete a Bachelor of Science degree in Computer Science with a multimedia and graphics concentration, students must complete the requirements for the bachelor’s degree, including the following:
Two of the following courses (6 credits):
- CSE 471 Media Processing and Multimedia Computing 3
- CSE 472 Computer Graphics 3
- CSE 476 Mobile Application Development 3
- CSE 477 Web Application Architecture and Development 3
Three of the following courses not taken above (8 or 9 credits):
- CSE 471 Media Processing and Multimedia Computing 3
- CSE 472 Computer Graphics 3
- CSE 476 Mobile Application Development 3
- CSE 477 Web Application Architecture and Development 3
- CSE 803 Computer Vision 3
- CMSE 402 Data Visualization Principles and Techniques 3
- FLM 230 Introduction to Film 3
- FLM 260 Introduction to Digital Film and Emergent Media 3
- MI 231 Game and Interactive Media Development 3
- MI 247 Three-Dimensional Graphics and Design 3
- MI 337 Compositing and Special Effects 3
- MI 347 Advanced Three-Dimensional Computer Animation 3
- MI 350 Evaluating Human-Centered Technology 3
- MI 377 Advanced 3D Modeling 3
- MI 445 Game Design and Development I 3
- MI 450 Creating Human-Centered Technology 3
- MI 455 Game Design and Development II 3
- MI 462 Social Media and Social Computing 3
- MI 482 Building Virtual Worlds (W) 3
- MI 497 Game Design Studio 3
- STA 380 Electronic Art 3
STA 384 Experiments in Digital Video  3
THR 205 Media Acting I      2
THR 419 Projection Design for Live Performance  3

Software Engineering
To complete a Bachelor of Science degree in Computer Science with a software engineering concentration, students must complete the requirements for the bachelor’s degree, including the following:
The following course (3 credits):
CSE 435 Software Engineering     3
Four of the following courses (12 credits):
CSE 431 Algorithm Engineering     3
CSE 476 Mobile Application Development    3
CSE 477 Web Application Architecture and Development  3
CSE 480 Database Systems            3
CSE 870 Advanced Software Engineering    3
MI 350 Evaluating Human-Centered Technology 3
MI 420 Interactive Prototyping      3
MI 450 Creating Human-Centered Technology (W) 3

Theory
To complete a Bachelor of Science degree in Computer Science with a theory concentration, students must complete the requirements for the bachelor’s degree, including the following:
The following course (3 credits):
CSE 460 Computability and Formal Language Theory   3
One of the following courses (3 credits):
CSE 431 Algorithm Engineering     3
CSE 830 Design and Theory of Algorithms    3
Three of the following courses (9 or 10 credits):
CSE 835 Algorithmic Graph Theory     3
CSE 860 Foundations of Computing            3
MTH 299 Transitions                        4
MTH 416 Introduction to Algebraic Coding   3
MTH 417 Topics in Number Theory            3
MTH 880 Combinatorics I                   3
MTH 882 Combinatorics II                  3

Effective Fall 2024.

3. Request to change the requirements in the Minor in Computer Science in the Department of Computer Science and Engineering.

a. Under the heading Requirements for the Minor in Computer Science make the following changes:

(1) In item 1., add the following course:
CSE 300 Social, Ethical, and Professional Issues in Computing  1

(2) In item 1., change the total credits from ‘12’ to ‘13’.

(3) In item 2 add the following courses:
CSE 380 Information Management and the Cloud    3
CSE 434 Autonomous Vehicles                      3

Effective Fall 2024.
COLLEGE OF NATURAL SCIENCE

1. Request to change the requirements for the Bachelor of Science degree in Environmental Biology/Zoology in the Department of Integrative Biology.

a. Under the heading Requirements for the Bachelor of Science Degree in Environmental Biology/Zoology make the following changes:

(1) In item 1., replace paragraph two with the following:

The University's Tier II writing requirement for the Environmental Biology/Zoology major is met by completing both of the following courses: Zoology 355L and 445. Those courses are referenced in item 3. below.

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

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

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHY 221</td>
<td>Studio Physics for Life Scientists I</td>
<td>4</td>
</tr>
<tr>
<td>PHY 222</td>
<td>Studio Physics for Life Scientists II</td>
<td>4</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>PHY 183</td>
<td>Physics for Scientists and Engineers I</td>
<td>4</td>
</tr>
<tr>
<td>PHY 184</td>
<td>Physics for Scientists and Engineers II</td>
<td>4</td>
</tr>
<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>LB 273</td>
<td>Physics I</td>
<td>4</td>
</tr>
<tr>
<td>LB 274</td>
<td>Physics II</td>
<td>4</td>
</tr>
<tr>
<td>PHY 193H</td>
<td>Honors Physics I-Mechanics</td>
<td>4</td>
</tr>
<tr>
<td>PHY 294H</td>
<td>Honors Physics II-Electromagnetism</td>
<td>4</td>
</tr>
<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>IBIO 306</td>
<td>Invertebrate Biology</td>
<td>4</td>
</tr>
<tr>
<td>IBIO 483</td>
<td>Environmental Physiology (W)</td>
<td>4</td>
</tr>
</tbody>
</table>

(3) In item 3. g. delete the following courses:

Add the following courses:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEO 221</td>
<td>Introduction to Geographic Information</td>
<td>3</td>
</tr>
<tr>
<td>GEO 221L</td>
<td>Introduction to Geographic Information Laboratory</td>
<td>1</td>
</tr>
</tbody>
</table>

Replace the note with the following:

Both Geography 221 and 221L must be completed to satisfy this requirement. Forestry 419 may be substituted for GEO 221/221L. Forestry 340 may be substituted for Plant Biology 441.

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

At least one course from each of the following three groups of courses totaling at least 13 credits:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>FW 471</td>
<td>Ichthyology</td>
<td>4</td>
</tr>
<tr>
<td>IBIO 306</td>
<td>Invertebrate Biology</td>
<td>4</td>
</tr>
<tr>
<td>IBIO 328</td>
<td>Comparative Anatomy and Biology of Vertebrates</td>
<td>4</td>
</tr>
<tr>
<td>IBIO 360</td>
<td>Biology of Birds</td>
<td>4</td>
</tr>
<tr>
<td>IBIO 365</td>
<td>Biology of Mammals</td>
<td>4</td>
</tr>
<tr>
<td>IBIO 384</td>
<td>Biology of Amphibians and Reptiles (W)</td>
<td>4</td>
</tr>
<tr>
<td>PLB 218</td>
<td>Plants of Michigan</td>
<td>3</td>
</tr>
<tr>
<td>PLB 418</td>
<td>Plant Systematics</td>
<td>3</td>
</tr>
</tbody>
</table>
2. Request to change the requirements for the Bachelor of Science degree in Integrative Biology in the Department of Integrative Biology.

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

(1) In item 1., replace paragraph two with the following:

The University's Tier II writing requirement for the Zoology major is met by completing both of the following courses: Zoology 355L and 445. Those courses are referenced in item 3. below.

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

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

(1) PHY 221 Studio Physics for Life Scientists I  4  
PHY 222 Studio Physics for Life Scientists II  4  
(2) PHY 231 Introductory Physics I  3  
PHY 232 Introductory Physics II  3  
PHY 251 Introductory Physics Laboratory I  1  
PHY 252 Introductory Physics Laboratory II  1  
(3) 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  
(4) LB 273 Physics I  4  
LB 274 Physics II  4  
(5) PHY 193H Honors Physics I-Mechanics  4  
PHY 294H Honors Physics II-Electromagnetism  4  
PHY 191 Physics Laboratory for Scientists, I  1  
PHY 192 Physics Laboratory for Scientists, II  1  

(3) In item 3. j. delete the following course:

IBIO 483 Environmental Physiology (W)  4  

Add the following course:

IBIO 483 Environmental Physiology  3  

Effective Fall 2024.
3. Request to change the requirements for the Bachelor of Arts degree in Zoology in the Department of Integrative Biology.

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

      (1) In item 1., replace paragraph two with the following:

      The University's Tier II writing requirement for the Zoology major is met by completing both of the following courses: Zoology 355L and 445. Those courses are referenced in item 3. below.

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

      PHY 221 Studio Physics for Life Scientists I 4

      (3) In item 3. i. (1) Writing, delete the following course:

      WRA 341 Nature, Environmental, and Travel Writing 3

      (4) In item 3. i. (2) Communications, delete the following courses:

      CSUS 325 Study and Practice of Communication for Sustainability (W) 3
      FW 435 Integrated Communications for the Fisheries and Wildlife Professional 3

      Add the following course:

      CMSE 201 Computational Modeling and Data Analysis I 4

   Effective Fall 2024.

4. Request to change the requirements for the Bachelor of Science degree in Zoology in the Department of Integrative Biology.

   The concentrations in the Bachelor of Science degree in Zoology are noted on the student’s academic record when the requirements for the degree have been completed.

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

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

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

      (1) PHY 221 Studio Physics for Life Scientists I 4
      (2) PHY 222 Studio Physics for Life Scientists II 4
      (3) PHY 231 Introductory Physics I 3
      (4) PHY 232 Introductory Physics II 3
      (5) PHY 251 Introductory Physics Laboratory I 1
      (6) PHY 252 Introductory Physics Laboratory II 1
      (7) PHY 183 Physics for Scientists and Engineers I 4
      (8) PHY 184 Physics for Scientists and Engineers II 4
      (9) LB 273 Physics I 4
      (10) LB 274 Physics II 4

   Effective Fall 2024.
(5) PHY 193H Honors Physics I-Mechanics 4  
PHY 294H Honors Physics II-Electromagnetism 4  
PHY 191 Physics Laboratory for Scientists, I 1  
PHY 192 Physics Laboratory for Scientists, II 1  

(2) In item 3. g. Animal Behavior and Neurobiology concentration, make the following changes:

(a) In item (2), delete the following course:
   
   IBIO 402 Neurobiology 3  
   
   Add the following course:
   
   IBIO 300 Neurobiology 3  
   
(b) Replace item (3) with the following:
   
   One of the following, either (a) or (b) (4 or 8 credits):
   
   (a) One of the following courses (4 credits):
   
   IBIO 306 Invertebrate Biology 4  
   IBIO 328 Comparative Anatomy and Biology of Vertebrates 4  
   
   (b) Two of the following courses (8 credits):
   
   FW 471 Ichthyology 4  
   IBIO 360 Biology of Birds 4  
   IBIO 365 Biology of Mammals 4  
   IBIO 384 Biology of Amphibians and Reptiles (W) 4  
   
(c) In item (4) delete the following courses:
   
   ANS 405 Endocrinology of Reproduction 4  
   FW 419 Applications of Geographic Information Systems to Natural Resource Management 4  
   GEO 324 Remote Sensing of the Environment 4  
   GEO 325 Geographic Information Systems 3  
   IBIO 483 Environmental Physiology (W) 4  
   PSY 402 Sensation and Perception (W) 3  
   
   Add the following courses:
   
   FW 419 Applications of Geographic Information Systems to Natural Resource Management 4  
   IBIO 483 Environmental Physiology 3  
   NEU 310 Psychology and Biology of Human Sexuality 3  
   NEU 416 Development of the Nervous System Through the Lifespan 3  

(3) Delete the Cell and Developmental Biology concentration.

Students currently enrolled in the major have until US28 to complete the requirements for this concentration and have it noted on the student’s academic record.

(4) In item 3. g. Ecology, Evolution, and Organismal Biology concentration make the following changes:

(a) Replace item (2) with the following:

   Two of the following courses (8 credits):
   
   FW 471 Ichthyology 4  
   IBIO 306 Invertebrate Biology 4
IBIO 328 Comparative Anatomy and Biology of Vertebrates 4
IBIO 360 Biology of Birds 4
IBIO 365 Biology of Mammals 4
IBIO 384 Biology of Amphibians and Reptiles (W) 4

(b) In item (3) delete the following courses:
IBIO 316 General Parasitology 3
IBIO 483 Environmental Physiology (W) 4
Add the following course:
IBIO 483 Environmental Physiology 3

(c) In item (4) delete the following courses:
GEO 324 Remote Sensing of the Environment 4
GEO 325 Geographic Information Systems 3

(5) Delete the Genetics concentration.

Students currently enrolled in the major have until US28 to complete the requirements for this concentration and have it noted on the student's academic record.

(6) Delete the General Zoology concentration.

Students currently enrolled in the major have until US28 to complete the requirements for this concentration and have it noted on the student's academic record.

(7) In item 3. g. Marine Biology concentration, make the following changes:
(a) In item (1) change the total credits from ‘23’ to ‘21’.
(b) In item (1) delete the following courses:
IBIO 303 Oceanography 4
IBIO 483 Environmental Physiology (W) 4
Add the following courses:
GLG 303 Oceanography 3
IBIO 483 Environmental Physiology 3

(c) Replace item (2) with the following:
One course from each of the following groups of courses (7 or 8 credits):
(a) FW 471 Ichthyology 4
IBIO 306 Invertebrate Biology 4
IBIO 360 Biology of Birds 4
IBIO 365 Biology of Mammals 4
IBIO 384 Biology of Amphibians and Reptiles (W) 4
(b) BMB 401 Comprehensive Biochemistry 4
CEM 383 Introductory Physical Chemistry I 3
FW 416 Marine Ecology and Management 3
FW 424 Wildlife Population Analysis and Management 3
GEO 221 Introduction to Geographic Information 3
And GEO 221L Introduction to Geographic Information Laboratory 1
IBIO 357 Global Change Biology (W) 3
MMG 425 Microbial Ecology 3
Both GEO 221 and 221L must be completed to satisfy this requirement.
(d) In item (3) delete the following courses:

ENT 469 Biomonitoring of Streams and Rivers  3
IBIO 440 Field Ecology and Evolution   4
PLB 424 Algal Biology     4

Add the following course:

PLB 424 Algal Biology     3

(8) Replace the Zoo and Aquarium Science concentration with the following:

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

IBIO 313 Animal Behavior     3
IBIO 341 Fundamental Genetics    4
IBIO 355 Ecology     3
IBIO 355L Ecology Laboratory (W)    1
IBIO 369 Zoo Animal Biology and Conservation  3
IBIO 369 Introduction to Zoo and Aquarium Science  3
IBIO 445 Evolution (W)     3
IBIO 489 Seminar in Zoo and Aquarium Science  1
IBIO 498 Internship in Zoo and Aquarium Science  4

(2) Two of the following courses (8 credits):

FW 471 Ichthyology     4
IBIO 306 Invertebrate Biology    4
IBIO 328 Comparative Anatomy and Biology of Vertebrates  4
IBIO 360 Biology of Birds     4
IBIO 365 Biology of Mammals     4
IBIO 384 Biology of Amphibians and Reptiles (W)  4

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

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

Effective Fall 2024.
PART II - NEW COURSES AND CHANGES

COLLEGE OF AGRICULTURE AND NATURAL RESOURCES

CSS 865   Environmental Organic Chemistry
Spring of even years. Fall of odd years. 3(3-0) RB: Students with an environmental science background and course training in general or organic chemistry
Fate and transformation of organic contaminants in the environment
Effective Fall Semester 2025

CSS 880   Scientific Communication and Professional Development
Spring of every year. Fall of every year. 1(0-2) 2(2-0) RB: Recommended for graduate students in CSS
Interactive professional experiences including grant preproposal preparation and presentation, scientific presentations, mock position interviews, and resume preparation. Career management and pathways, scientific communication, and leadership skills designed to prepare students to become successful professionals in STEM.
Request the use of the Pass-No Grade (P-N) system.
Effective Fall Semester 2025

FOR 340L   Forest Ecology Laboratory
Fall of every year 4(0-3) 2(0-6) P: ((CSS 210) and completion of Tier I writing requirement) and (FOR 340 or concurrently) and (PLB 105 or BS 162 or LB 144) RB: IBIO 355
Field studies and data analysis of ecological processes central to the sustainable management of forest ecosystems. Field exercises cover primary production, community structure, soil resources, biodiversity, succession, nutrient cycling, critiques of primary literature. Weekend field trips required. Field studies and data analysis of ecological processes central to the sustainable management of forest ecosystems. Field exercises cover primary production, community structure, soil resources, biodiversity, succession, nutrient cycling, critiques of primary literature. Pre-semester field camp required.
SA: FOR 404L
Effective Fall Semester 2023

COLLEGE OF ENGINEERING

CE 840   Introduction to Transportation Engineering
Fall of every year. Spring of every year. 3(3-0) A student may earn a maximum of 3 credits in all enrollments for this course. R: Open to graduate students in the College of Engineering or in the Department of Civil and Environmental Engineering or in the Civil Engineering Major. A student may earn a maximum of 3 credits Not open to students with credit in CE 341.
NEW  Introduction to transportation engineering, including: transportation planning, traffic engineering, geometric design, traffic flow and highway capacity, queuing theory, traffic control, and highway safety.
Effective Fall Semester 2024

CSE 380   Information Management and the Cloud
Fall of every year. Spring of every year. 3(3-0) P: CSE 232 R: Open to students in the College of Engineering or in the Lyman Briggs Computer Science Coordinate Major or in the Lyman Briggs Computer Science Major.
NEW  Introduction to information management and cloud computing
Effective Fall Semester 2024
CSE 415  Introduction to Parallel Computing  
Spring of every year. 3(3-0) P: CSE 320 or ECE 331 and (MTH 314 or ECE 280) and CSE 331 
P: (MTH 314 or MTH 317H or ECE 280) and CSE 331 R: Open to juniors or seniors in the College 
of Engineering or in the Lyman Briggs Computer Science Coordinate Major or in the Lyman 
Briggs Computer Science Major or in the Data Science Major. Not open to students with credit 
in CMSE 401.  
Principles and techniques of parallel computing including architectures, programming 
models, and algorithm design. 
Effective Fall Semester 2024

CSE 425  Introduction to Computer Security  
Fall of every year. Spring of every year. 3(3-0) P: CSE 325 P: CSE 325 and CSE 380 R: Open to juniors or seniors in the College of Engineering or in the Lyman Briggs 
Computer Science Coordinate Major or in the Lyman Briggs Computer Science Major.  
Theory and practice of computer security engineering. 
Effective Fall Semester 2025

CSE 476  Mobile Application Development  
Spring of every year. 3(3-0) P: CSE 320 or CSE 331 or CSE 335 P: CSE 380 R: Open to juniors or seniors in the College of Engineering or in the Computer Science Minor or in the Lyman Briggs Computer Science Coordinate Major or in the Lyman Briggs Computer Science Major.  
Software development techniques for mobile devices such as smart phones and tablet 
computers. 
Effective Fall Semester 2025

CSE 477  Web Application Architecture and Development  
Spring of every year. 3(3-0) P: CSE 320 or CSE 331 or CSE 335 P: CSE 380 R: Open to juniors or seniors in the College of Engineering or in the Computer Science Minor or in the Lyman Briggs Computer Science Coordinate Major or in the Lyman Briggs Computer Science Major.  
Fundamentals of World Wide Web (WWW) programming, including protocols, client- 
server interaction, markup languages, client- and server-side programming, databases, 
and remote procedure calls. Development of a WWW server and WWW sites with 
browser-based interfaces to remote databases. Students will incorporate scaling, 
throughput, and latency considerations in the development of widely-distributed 
systems. Fundamentals of World Wide Web (WWW) programming, including protocols, 
client-server interaction, markup languages, client- and server-side programming, 
databases, and remote procedure calls. Development of a WWW server and WWW sites 
with browser-based interfaces to remote databases. 
Effective Fall Semester 2025

CSE 480  Database Systems  
Spring of every year. 3(3-0) P: CSE 331 or CSE 335 P: CSE 380 R: Open to juniors or seniors in the College of Engineering or in the Computer Science Minor or in the Lyman Briggs Computer Science Coordinate Major or in the Lyman Briggs Computer Science Major or in the Data Science Major.  
Principles and technologies for database systems, algorithms, languages, and 
applications. 
SA: CPS 480  
Effective Fall Semester 2025

CSE 482  Big Data Analysis  
Spring of every year. 3(3-0) P: (CSE 331) and (STT 351 or STT 380 or STT 430 or STT 441) and MTH 314 and (MTH 234 or MTH 254H or LB 220) P: (CSE 331 and CSE 380) and (STT 351 or STT 380 or STT 430 or STT 441) and (MTH 314 or MTH 317H) and (MTH 234 or MTH 254H or LB 220) R: Open to juniors or seniors in the College of Engineering or in the Lyman Briggs Computer Science Coordinate Major or in the Lyman Briggs Computer Science Major or in the Data Science Major.  
Principles and techniques for large-scale data analysis and applications. 
Effective Fall Semester 2025
CSE 493  Selected Topics in Computing  
Fall of every year. Spring of every year. 1 to 4 credits. A student may earn a maximum of 9 credit in all enrollments for this course. R: Approval of department; application required.  
NEW  Topics selected to supplement and enrich existing courses and lead to the development of new courses.  
Effective Fall Semester 2024

CSE 494  Independent Study in Data Science  
Fall of every year. Spring of every year. Summer of every year. 1 to 3 credits. Interdepartmental with Computational Mathematics, Science, & Engineering, Computational Mathematics, Science, & Engineering, Computational Mathematics, Science, & Engineering, Computational Mathematics, Science, & Engineering, Computational Mathematics, Science, & Engineering. A student may earn a maximum of 3 credit in all enrollments for this course. R: Open to students in the Computational Data Science Major or in the Computer Engineering Major or in the Computer Science Major or in the Data Science Major. Approval of department; application required.  
NEW  Supervised individual study in an area of Data Science  
Effective Fall Semester 2024

CSE 498  Collaborative Design (W)  
Fall of every year. Spring of every year. 4(2-4) P: (CSE 402 or CSE 415 or CSE 422 or CSE 431 or CSE 440 or CSE 450 or CSE 471 or CSE 476 or CSE 477 or CSE 482) and (CSE 402 or CSE 420 or CSE 425 or CSE 435 or CSE 440 or CSE 472 or CSE 477 or CSE 480 or CSE 482) and ((CSE 300 and CSE 325 and CSE 335) and completion of Tier I writing requirement) P: (CSE 402 or CSE 415 or CSE 422 or CSE 431 or CSE 440 or CSE 450 or CSE 471 or CSE 476 or CSE 477 or CSE 482) and (CSE 402 or CSE 420 or CSE 425 or CSE 435 or CSE 440 or CSE 440 or CSE 460 or CSE 472 or CSE 477 or CSE 480 or CSE 482) and ((CSE 300 and CSE 325 and CSE 335 and CSE 380) and completion of Tier I writing requirement) R: Open to students in the Computer Science Major or in the Lyman Briggs Computer Science Coordinate Major.  
Development of a comprehensive software and/or hardware solution to a problem in a team setting with emphasis on working with a client. Participation in a design cycle including specification, design, implementation, testing, maintenance, and documentation. Issues of professionalism, ethics, and communication. Students may be asked to sign a non-disclosure agreement ("NDA") or an assignment of intellectual property rights ("IP Assignment") to work with some project sponsors.  
SA: CSE 449, CSE 478, CSE 479  
Effective Fall Semester 2025

COLLEGE OF NATURAL SCIENCE

ISE 800  Problems in Science or Mathematics for Teachers  
Fall of every year. Spring of every year. Summer of every year. 1 to 5 credits. A student may earn a maximum of 15 credit in all enrollments for this course. RB: Secondary certification in biological sciences, physical sciences or chemistry; secondary certification in Mathematics or Mathematics Education. R: Approval of college.  
REINSTATEMENT  Supervised study of problems or issues in biological science, or physical sciences, or mathematical sciences.  
SA: NSC 800, SME 800  
Effective Fall Semester 2024