

**MICHIGAN STATE
UNIVERSITY**

December 1, 2011

MEMORANDUM

TO: Dr. Douglas Estry, Associate Provost for Undergraduate Education
and Dean of Undergraduate Studies

FROM: Dr. Linda O. Stanford, Associate Provost for Academic Services

RE: Request for a New Minor in History, Philosophy, and Sociology of
Science

For Transmittal to the University Committee on Undergraduate Studies

The request referenced above is being sent to the University Committee on Undergraduate Studies in accordance with the *Bylaws for Academic Governance*, 4.4.

Response Requested:

Please ask the committee to consider the request referenced above and provide consultative commentary. Please mail the related materials referenced under the heading Attachments at the end of this memorandum to the committee members.

After receiving the committee's consultative response, the Provost will make a determination to forward or not to forward the request to the University Committee on Curriculum for its approval of curriculum and degree requirements.

If you have any questions, please call Joy Speas, University Curriculum Administrator, at 5-8420.

Thank you.

Attachments:

1. Request to Establish a New Academic Program form dated October 18, 2011: Minor in History, Philosophy, and Sociology of Science and attachments.



**University
Curriculum and
Catalog**

176 Administration Bldg.
East Lansing, MI
48824-1046

517-355-8420
Fax: 517-353-1935

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LYMAN BRIGGS COLLEGE

1. Request to establish a **Minor in History, Philosophy, and Sociology of Science** in Lyman Briggs College. The University Committee on Undergraduate Studies (UCUS) will consider this request.

a. **Background information:**

Due to the recent 25% increase in the size of the student body as part of the expansion of Lyman Briggs College, the proposed minor will allow students to take advantage of studying history, philosophy and sociology of science topics in greater depth.

b. **Academic Programs Catalog Text:**

The Minor in History, Philosophy, and Sociology of Science, which is administered by Lyman Briggs College, is designed to increase students understanding of the epistemological foundations and ethical elements of science while learning more of the history of some areas of science and appreciating the complex ways that science is connected to other social institutions and practices.

The minor is available as an elective to students who are enrolled in a bachelor's degree program in Lyman Briggs College at Michigan State University. Students majoring in History, Philosophy, and Sociology of Science in Lyman Briggs College are not eligible for the minor. With the approval of the college, the courses that are used to satisfy the minor may also be used to satisfy the requirements for the bachelor's degree. At least 12 unique credits counted towards the requirements for a student's minor must not be used to fulfill the requirements for that student's major.

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

Requirements for the Minor in History, Philosophy, and Sociology of Science
CREDITS

Complete 15 to 16 credits from the following:

- | | | | |
|----|--|------|--|
| 1. | Two of the following courses (8 credits): | | |
| | LB | 330 | Topics in History, Philosophy, and Sociology of Science (W) 4 |
| | LB | 331 | Literature and Science (W) 4 |
| | LB | 332 | Technology and Culture (W) 4 |
| | LB | 333 | Topics in History of Science (W) 4 |
| | LB | 334 | Science, Technology, and Public Policy (W) 4 |
| | LB | 335 | The Natural Environment: Perceptions and Practices (W) 4 |
| | LB | 336 | Gender, Sexuality, Science, Technology (W) 4 |
| | LB | 355 | Philosophy of Technology (W) 4 |
| | LB | 490E | Advanced Directed Study in History, Philosophy, and Sociology of Science (W) 4 |
| 2. | Two of the following courses (7 or 8 credits): | | |
| | ENG | 473A | Literature and Medicine 3 |
| | ESA | 430 | Environmental and Natural Resource Law 3 |
| | ESA | 440 | Environmental and Natural Resource Policy in Michigan 3 |
| | GEO | 435 | Geography of Health and Disease 3 |
| | HST | 416 | History of the Atomic Bomb and Nuclear Culture 3 |
| | HST | 420 | History of Sexuality since the 18 th Century 3 |
| | HST | 425 | American and European Health Care since 1800 4 |
| | HRT | 486 | Biotechnology in Agriculture: Applications and Ethical Issues 3 |
| | LB | 330 | Topics in History, Philosophy, and Sociology of Science (W) 4 |
| | LB | 331 | Literature and Science (W) 4 |
| | LB | 332 | Technology and Culture (W) 4 |
| | LB | 333 | Topics in History of Science (W) 4 |

LB	334	Science, Technology, and Public Policy (W)	4
LB	335	The Natural Environment: Perceptions and Practices (W)	4
LB	336	Gender, Sexuality, Science, Technology (W)	4
LB	355	Philosophy of Technology (W)	4
LB	490E	Advanced Directed Study in History, Philosophy, and Sociology of Science (W)	4
MC	350	Evolution and Society	4
MC	351	Science and Social Policy	4
MC	459	Science, Technology, Environment and Public Policy Capstone (N)	3
PHL	380	Nature of Science	3
PHL	462	Philosophy of Mind	3
PHL	480	Philosophy of Science	4
PHL	484	Philosophy of Biological Science	3
PHL	485	Philosophy of Social Science	3
SOC	368	Science, Technology, and Society	3
SOC	452	Environment and Society	3
SOC	452L	Internship in Environment and Society	1
SOC	475	Sociology of Health Care Systems	3
SOC	476	Social Psychology of Health	3
ZOL	446	Environmental Issues and Public Policy	3

Courses used to fulfill requirement 1. above may not be used to fulfill this requirement. Other courses may be used in fulfillment of this requirement with the approval of the student's academic advisor.

Effective Fall 2012.

View a Program		Main Menu
Joy Speas, RO	Wednesday, 10/19/2011	
Program Name: History, Philosophy, and Sociology of Science Degree: MNUN Sequence Number: 1	Program Request ID: 2070	
Effective Dates: Fall 2012 - Open Status: Interim Initial Action: New		
Requested Date: 10/3/2011 6:22:14 PM		
<p>1. Department/School/College: 28546 Lyman Briggs College</p> <p>2. Name of Program: History, Philosophy, and Sociology of Science</p> <p>3. Name of Degree: MNUN</p> <p>4. Type of Program: Minor</p> <p>5. Effective Start Semester: Fall 2012</p> <p>6. Target student audience for the program: LBC undergraduates</p> <p>7. Enrollment: What is the expected enrollment per year: 24 What is the minimum enrollment acceptable: 10</p> <p>8. Source of budget for the program: To align academic planning and curricular change, ALL requests for NEW funds must be included in the College's annual planning letter. Provost approval of new funds and the effective date for the new program must align. If funding is not approved, then the program request will not be forwarded to Faculty Senate. Internal reallocation If new funds, was this request included in the College's annual planning letter? Indicate yes or no. If no, then this is a department or college fund reallocation (If the program is implemented, no additional resources are required.).</p> <p>9. Projected Costs as compared to other programs in unit: Same</p> <p>10. Staff requirement: How many additional staff will be required: 0 Who will provide the primary instruction. Describe any external linkages(industry, government, etc.):</p>		

Existing faculty from ENG, CARRS, GEO, HRT, HST, LBC, JMC, PHL, SOC, and ZOL

11. Will additional equipment be required:

Approximate cost: 0

Source of funding:

12. Will additional library materials be required:

Approximate cost: 0

Source of funding: No funds will be requested.

13. Will additional space be required:

Type:

Approximate amount:

14. If the program requirements contain a named concentration, do you wish for the concentration to be noted on the student's transcript?:

No

15. Detailed Description:

A) Background: In the last several years there has been not only a 25% increase in the size of the student body as part of the expansion of Lyman Briggs College (LBC), but also a higher retention rate of all Briggs students. With many more students staying in Briggs through graduation, LBC has also expanded its upper-division course offerings in history, philosophy, and sociology of science (HPS), as well as its HPS faculty, resulting in one of the largest programs in the country. The proposed HPS minor allows students to take advantage of this programmatic strength.

B) Rationale: The Lyman Briggs HPS curriculum, with its explicit focus on understanding the nature of science, its history, and its place in society, differentiates a Briggs' graduate from students who come from a traditional science department. With increasing emphasis in national science education standards on the importance of these topics, the Briggs HPS program provides our students with a clear advantage that helps them whether they go on to a graduate program, medical school, or some other professional program. All Briggs students take the core HPS courses, but some students are inspired to delve into these topics in greater depth, while still maintaining a science major. The HPS minor serves this group of students.

C) Administrative Unit: LBC will serve as the administrative home for the minor. LBC has been the home of MSU's HPS program and faculty for nearly 45 years, and most of the core members of the HPS faculty have LBC as their primary appointment.

D) Educational Objectives: In the HPS minor, students will (1) increase their understanding of the epistemological foundations and ethical elements of science, (2) learn more of the history of some area of science, and (3) better appreciate the complex ways that science is connected to other social institutions and practices.

E) Faculty Instrumental in Developing Specialization: The planning group for this minor includes all HPS faculty in LBC.

NAME	UNITS
Rich Bellon	LBC / HST
Barry DeCoster	LBC
Sharon DeGraw	LBC
Aaron McCright	LBC/SOC
Georgina Montgomery	LBC/HST
Michael Nelson	LBC/FW/PHL
Robert Pennock	LBC/PHL/CSE
Robert Shelton	LBC
Sean Valles	LBC/PHL
Helen Veit	HST/LBC
Mark Waddell	LBC/HST
Naoko Wake	LBC
John Waller	LBC/HST

F) Minor Assessment Procedures: This program will be evaluated each year using an online survey of participants completing the minor. Questions will be aimed at understanding student learning as well as ways to better improve coordination and sequencing of courses.

Michigan State University

Assessing Student Outcomes

College: Lyman Briggs College

Department: Lyman Briggs College

Program or Major: History, Philosophy, and Sociology of Science (HPS)

Program Level: Undergraduate Minor

Contact Person: Kelly Millenbah

Inventory of Written Statements and Plans

1. Do you have a written mission statement or statement of purpose? **yes** **no**

If yes, please attach a copy or reference where this can be found:

<http://lymanbriggs.msu.edu/parents/mission.cfm>

2. Do you have a written statement of intended educational outcomes **yes** **no**

describing what a student should know or be able to do when they have completed this program?

3. Do you have a written method of assessment for measuring student **yes** **no**

outcomes?

4. Does your program have a separate accreditation process? **yes** **no**

If yes, please list all accrediting agencies below:

Assessment Methodologies

It is likely that some assessment measures are already in place in this program even if they are not identified as being part of a formal assessment plan. Listed below are some of the assessment methodologies you may be using. Indicate "A" if the method is currently being

used; **"B"** if it is **not** being used but you are interested in using it; and **"C"** if the method of assessment does not apply to your program.

Direct Methods of Assessment

1. C Comprehensive Examinations
2. A Writing proficiency Examinations
3. C National Examinations assessing subject matter knowledge
4. C Graduate Record Exam General Test
5. C Graduate Record Exam Subject Test
6. C Certification Examinations
7. C Licensure Examinations
8. A Locally developed pre-test or post-test for subject matter knowledge
9. A Senior thesis or major project
10. B Portfolio evaluation of student work
11. A Capstone courses
12. C Audio or Video tape evaluations

Indirect Methods of Assessment

1. C Comparison or benchmarking with peer institutions
2. B Job placement of graduates
3. B Employer surveys
4. C Advisory groups from your profession
5. C Graduate school acceptance rates
6. C Student graduation/retention rates
7. B Exit interviews with students graduating or leaving the program

1. How has your department used any of the indicators above to improve services and programs for students?

Feedback that we receive from students is used to critically update a revise courses and programmatic offerings.

2. When you think about developing and implementing an assessment plan, what concerns do you have?

Primarily concerns include an ability to use the most appropriate assessment procedures.

Return this form to: Kelly Funk

221 Administration Building

Assessing Student Outcomes modified and used with permission, Dr. Sharron L. Ronco, Florida Atlantic University

G) Program Description for Catalog:

Minor in History, Philosophy, and Sociology of Science

The undergraduate minor in History, Philosophy, and Sociology of Science is administered by Lyman Briggs College. The minor is available as an elective to students who are enrolled in a bachelor's degree program in Lyman Briggs College at Michigan State University. With the approval of Lyman Briggs College, the courses used to satisfy the minor may also be used to satisfy the requirement for the bachelor's degree. At least 12 unique credits counted towards the requirements for a student's minor must not be used to fulfill the requirements for the student's major.

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

Requirements for the Minor in History, Philosophy, and Sociology of Science

Complete 15 – 16 credits from the following:

1. Complete any 2 of the following courses (8 credits)

LB 330

Topics in History, Philosophy, and Sociology of Science (w)

4

*except HPS majors
P. Miller DAL
11-28-11*

LB 331	Literature and Science (W)	4
LB 332	Technology and Culture (W)	4
LB 333	Topics in History of Science (W)	4
LB 334	Science, Technology, and Public Policy (W)	4
LB 335	The Natural Environment: Perceptions and Practices (W)	4
LB 336	Gender, ^{Sexuality} Science, and Technology (W)	4
LB 355	Philosophy of Technology (W)	4
LB 490E	Advanced Directed Study in HPS ^{History, Philosophy, Sociology of Science} (W)	4
2. Complete any 2 of the following courses (may not repeat courses selected in 1. above) (7 - 8 credits)		
ENG 473A	Literature and Medicine	3
ESA 430	Environmental and Natural Resources ^{&} Law	3
ESA 440	Environmental and Natural Resources ^{&} Policy in Michigan	3
GEO 435	Geography of Health and Disease	3
HST 416	History of the Atomic Bomb and Nuclear Culture	3
HST 420	History of Sexuality since the 18th Century	3
HST 425	American and European Health Care since 1800	4
HRT 486	Biotechnology in Agriculture: Applications and Ethical Issues	3
LB 330	Topics in History, Philosophy, and Sociology of Science (W)	4
LB 331	Literature and Science (W)	4
LB 332	Technology and Culture (W)	4
LB 333	Topics in History of Science (W)	4
LB 334	Science, Technology, and Public Policy (W)	4
LB 335	The Natural Environment: Perceptions and Practices (W)	4
LB 336	Gender, ^{Sexuality} Science, and Technology (W)	4

LB 355	Philosophy of Technology (W)	4
LB 490E	Advanced Directed Study in HPS History, Philosophy, Sociology of Science (W)	4
MC 350	Evolution and Society	4
MC 351	Science and Social Policy	4
MC 459	Science, Technology, Environment and Public Policy Capstone (N)	3
PHL 380	Nature of Science	3
PHL 462	Philosophy of Mind	3
PHL 480	Philosophy of Science	4
PHL 484	Philosophy of Biological Science	3
PHL 485	Philosophy of Social Science	3
SOC 368	Science, Technology, and Society	3
SOC 452 and 452L	Environment and Society, and Internship in Environment and Society	4 3 1
SOC 475	Sociology of Health Care Systems	3
SOC 476	Social Psychology of Health	3
ZOL 446	Environmental Issues and Public Policy	3

Other courses may be used in fulfillment of this requirement with the approval of the Lyman Briggs College HPS faculty member responsible for approving course substitutions.

H) Locations: The program will be offered on the main campus.

I) Certificate Program:

J) Other Information:

16. Are there admissions requirements for this program?:

Grade or grade-point average requirements and if so in which course(s), portfolio requirement, audition, essay, etc. If there are not admission requirements other than those required by the University policy indicate "none".

None.

DEPARTMENT LEVEL APPROVAL STATUS

Approved: Lyman Briggs College
10/4/2011 7:07:32 AM by Kelly Millenbah for Elizabeth H. Simmons, Dean

SIGNOFFS STATUS

No Response by: James Madison College ✕

No Response by: Department of Community, Agriculture, Recreation and Resource Studies ✕

Signed Off: Department of English
10/4/2011 9:37:43 AM by Edward Watts for Steve Arch, Chairperson

Signed Off: Department of Geography
10/5/2011 10:46:09 AM by Richard Groop for Richard Groop, Chairperson

Signed Off: Department of History
10/6/2011 1:55:59 PM by Emily Tabuteau for Walter W. Hawthorne III, Chairperson

Comments: If LBC were willing to make the LB 3xx courses listed under requirement 1 of the specialization open to students in other colleges, quite a few non-Briggs students might be interested in this specialization.

No Response by: Department of Horticulture ✕

No Response by: Department of Philosophy ✕

Signed Off: Department of Sociology
10/4/2011 10:43:38 AM by Tobias TenEyck for David Wiley, Acting Chairperson

Signed Off: Department of Zoology
10/5/2011 8:36:04 AM by Lisa Craft for Fred Dyer, Chairperson

Comments: Dr. Will Kopachik, Chair Zoology Curriculum Committee

COLLEGE LEVEL APPROVAL STATUS

Approved: Lyman Briggs College
10/18/2011 8:14:57 PM by Kelly Millenbah for Elizabeth H. Simmons, Dean

UNDERGRADUATE PROGRAM

The Lyman Briggs College program leads to the Bachelor of Science Degree.

Requirements for the Bachelor of Science Degree in Lyman Briggs College

1. The University requirements for bachelor's degrees as described in the *Undergraduate Education* section of this University catalog; 120 credits, including general elective credits, are required for the Bachelor of Science degree in Lyman Briggs College.

Students who are enrolled in the College of Natural Science may complete the alternative track to Integrative Studies in Biological and Physical Sciences that is described in item 1. under the heading *Graduation Requirements* in the College statement. Certain courses referenced in requirement 3. below are equivalent to courses in the alternative track and, therefore, may be used to satisfy the alternative track.

The completion of the Lyman Briggs College mathematics and statistics requirement [referenced in item 3.c.(4) below] may also satisfy the University mathematics requirement.

The completion of Lyman Briggs 133 or one of the approved alternatives [referenced in requirement 3.a.(5)(a) below] may also be counted toward the University Tier I writing requirement.

The University's Tier II writing requirement for the Major and Coordinate Majors in Lyman Briggs College is met by completing Lyman Briggs College 492 and one of the following courses: English 473A; History 425; Lyman Briggs College 332, 333, 334, 335, 336, 355. Those courses are referenced in items 3. a. (5) and 3. a. (6) below.

2. The requirements of Lyman Briggs College for the Bachelor of Science degree, referenced in item 3. a. below.

The credits earned in certain courses referenced in requirement 3. below may be counted toward College requirements as appropriate.

3. The following requirements of Lyman Briggs College for the Bachelor of Science degree:

a. CORE PROGRAM CREDITS
46 to 58

- (1) **Biology:** One of the following groups of courses (8 to 10 credits):
 - (a) Lyman Briggs 144, 145.
 - (b) Lyman Briggs 148H, 149H, 158H, 159H.
 - (c) Biological Science 110, 111, 111L.
- (2) **Chemistry:** One of the following groups of courses (8 to 10 credits):
 - (a) Lyman Briggs 171, 171L, 172, 172L.
 - (b) Lyman Briggs 171, 171L; Chemistry 143
 - (c) Lyman Briggs 171, 171L; Chemistry 251.
 - (d) Chemistry 141, 142, 161.
 - (e) Chemistry 141, 143, 161.
 - (f) Chemistry 141, 161, 251.
 - (g) Chemistry 151, 152, 161.
 - (h) Chemistry 181H, 182H, 185H.
- (3) **Mathematics and Statistics:** One of the following groups of courses (6 to 11 credits):
 - (a) Lyman Briggs 118, 119.
 - (b) Lyman Briggs 118; Statistics and Probability 231.
 - (c) Mathematics 132, 133, 234.
 - (d) Mathematics 132, 133; Statistics and Probability 231.
 - (e) Mathematics 152H, 153H.
- (4) **Physics:** One of the following groups of courses (6 to 8 credits):
 - (a) Lyman Briggs 271, 271L, 272, 272L.
 - (b) Physics 231, 232, 251, 252.
 - (c) Physics 183, 184.
 - (d) Physics 181B, 182B, 251, 252.
 - (e) Physics 231B, 232B, 251, 252.
 - (f) Physics 183B, 184B.
 - (g) Physics 193H, 294H.
- (5) **History, Philosophy and Sociology of Science:** A total of 11 or 12 credits from the courses in groups (a), (b), and (c) below. In addition to completing one course from each of the three groups, the student must complete one of the following courses from group (b) or group (c): English 483; History 425; Lyman Briggs 332, 333, 334, 335, 336, 355.
 - (a) One of the following courses: Lyman Briggs 133; Writing, Rhetoric and American Cultures 110, 115, 120, 125, 130, 135, 140, 145, 150, 195H.
 - (b) One of the following courses: Lyman Briggs 331, 332, 333, 334, 335, 336, 355.
 - (c) One of the following courses: Lyman Briggs 330, 331, 332, 333, 334, 335, 336, 355, 490E; English 473A; History 425.

Each of the following courses may be used to meet either requirement 3.a.(5)(b) or requirement 3.a.(5)(c), but not both of those requirements: Lyman Briggs 331, 332, 333, 334, 335, 355.

- (6) **Senior Seminar:** Lyman Briggs 492 (4 credits).
- b. MAJOR or COORDINATE MAJOR.
Each student must complete the requirements of a Major or a Coordinate Major. The Major or Coordinate Major must be chosen

from the lists of options below. **Both** the Major or Coordinate Major *and* the related courses must be approved by the student's academic advisor. With the approval of the appropriate Lyman Briggs College Curriculum Coordinator or Undergraduate Director, courses other than those that are listed as requirements for a Major or Coordinate Major may be used to satisfy degree requirements.

Majors:

- Biology
- Computer Science
- Earth Science
- Environmental Science and Management
- Physical Science
- History, Philosophy and Sociology of Science

Coordinate Majors:

- (1) College of Agriculture and Natural Resources:
 - Animal Science
 - Fisheries and Wildlife
 - Entomology
- (2) College of Engineering:
 - Computer Science
 - Students are admitted to this Coordinate Major after they have reached junior standing and have met certain other requirements specified by Lyman Briggs College .
- (3) College of Natural Science:
 - Astrophysics
 - Biochemistry and Molecular Biology
 - Biochemistry/Biotechnology
 - Biological Science—Interdepartmental
 - Biomedical Laboratory Science
 - Chemical Physics
 - Chemistry
 - Computational Chemistry
 - Computational Mathematics
 - Diagnostic Molecular Science
 - Earth Science—Interdepartmental
 - Environmental Biology/Microbiology
 - Environmental Biology/Plant Biology
 - Environmental Biology/Zoology
 - Environmental Geosciences
 - Genomics and Molecular Genetics
 - Geological Sciences
 - Human Biology
 - Mathematics
 - Microbiology
 - Nutritional Sciences
 - Physical Science—Interdepartmental
 - Physics
 - Physiology
 - Plant Biology
 - Statistics
 - Zoology

Majors

	CREDITS
1. Biology	30
a. A minimum of 30 credits from the courses listed below including:	
(1) All of the following courses (18 credits):	
BMB 461 Biochemistry I	3
BMB 462 Biochemistry II	3
MMG 301 Introductory Microbiology	3
MMG 302 Introductory Microbiology Laboratory	1
ZOL 341 Fundamental Genetics	4
ZOL 355 Ecology	3
ZOL 355L Ecology Laboratory	1
(2) One of the following groups of courses (6 credits):	
(a) PLB 414 Plant Physiology: Metabolism	3
PLB 415 Plant Physiology	3
(b) PSL 431 Human Physiology I	3
PSL 432 Human Physiology II	3
(3) One course from group (a) and one course from group (b) below (6 to 8 credits):	
(a) Organismal and Population Biology	
(i) Students who complete Physiology 431 and 432 to satisfy requirement 1.a.(2) above must complete one of the following courses:	
ENT 404 Fundamentals of Entomology	3
PLB 418 Plant Systematics	3
PLB 434 Plant Structure and Function	4
PLB 441 Plant Ecology	3
(ii) Students who complete Botany 414 and 415 to satisfy requirement 1.a.(2) above must complete one of the following courses:	
ZOL 306 Invertebrate Biology	4
ZOL 328 Comparative Anatomy and Biology Of Vertebrates (W)	4
ZOL 353 Marine Biology (W)	4
ZOL 445 Evolution	3
(b) Cellular, Molecular, and Developmental Biology	
LB 347 Advances in Applied Biology	3
MMG 409 Eukaryotic Cell Biology	3
MMG 413 Virology	3

MMG 421 Prokaryotic Cell Physiology	3
MMG 431 Microbial Genetics	3
MMG 451 Immunology	3
ZOL 320 Developmental Biology	4
2. Computer Science	30
a. A minimum of 30 credits from the courses listed below including:	
(1) All of the following courses (24 credits):	
CSE 231 Introduction to Programming I	4
CSE 260 Discrete Structures in Computer Science	4
CSE 320 Computer Organization and Architecture	3
CSE 330 Algorithms and Data Structures	3
CSE 410 Operating Systems	3
CSE 460 Computability and Formal Language Theory	3
LB 220 Calculus III	4
(2) At least two of the following courses (6 credits):	
CSE 420 Computer Architecture	3
CSE 422 Computer Networks	3
CSE 435 Software Engineering	3
CSE 440 Introduction to Artificial Intelligence	3
CSE 450 Translation of Programming Languages	3
CSE 452 Organization of Programming Languages	3
CSE 472 Computer Graphics	3
CSE 480 Database Systems	3
3. Earth Science	27
a. A minimum of 27 credits from the courses listed below including:	
(1) At least 14 credits in courses at the 300–400 level.	
(2) At least 8 credits in earth science courses outside the Department of Geological Sciences.	
(3) At least one course in each of the following 5 earth science areas (15 to 22 credits).	
(a) Astronomy and Astrophysics	
AST 207 The Science of Astronomy	3
(b) Geology of the Solid Earth	
GLG 201 The Dynamic Earth	4
GLG 321 Mineralogy and Geochemistry	4
GLG 351 Structural Geology and Tectonics	4
GLG 361 Petrology (W)	4
GLG 401 Plate Tectonics (W)	4
GLG 481 Reservoirs and Aquifers	3
GLG 491 Field Geology – Summer Camp (W)	6
(c) Paleobiology	
GLG 431 Sedimentology and Stratigraphy (W)	4
GLG 433 Vertebrate Paleontology	4
GLG 434 Evolutionary Paleobiology	4
PLB 335 Plants Through Time	3
(d) Environmental Geosciences and Meteorology	
GEO 203 Introduction to Meteorology	3
GEO 401 Geography of Plants of North America	3
GEO 402 Agricultural Climatology	3
GEO 405 Weather Analysis and Forecasting	4
GLG 421 Environmental Geochemistry	4
(e) Geomorphology	
CSS 470 Soil Resources	3
GEO 407 Regional Geomorphology of the United States	3
GEO 408 Soil Geomorphology Field Study	4
Geography 206 and 206L, combined, may be substituted for one of the courses listed above.	
4. Environmental Sciences and Management	41
a. A minimum of 41 credits from the courses listed below including:	
(1) One of the following groups of courses (8 or 10 credits):	
(a) LB 118 Calculus I	5
STT 231 Statistics for Scientists	3
(b) MTH 132 Calculus I	3
MTH 133 Calculus II	4
STT 231 Statistics for Scientists	3
(2) One course from each of the following 7 areas (24 to 26 credits):	
(a) Ecology:	
ZOL 355 Ecology	3
ZOL 355L Ecology Laboratory	1
(b) Geology:	
GLG 201 The Dynamic Earth	4
(c) Taxonomy or Phylogenetic Biology:	
ENT 404 Fundamentals of Entomology	4
PLB 418 Plant Systematics	3
ZOL 306 Invertebrate Biology	4
(d) Biochemistry:	
BMB 401 Basic Biochemistry	4
(e) Aquatic Systems:	
FW 420 Stream Ecology	3
(f) Microbiology:	
MMG 301 Introductory Microbiology	3
(g) Economics:	
EC 201 Introduction to Microeconomics	3
(3) One course from each of the following three groups (9 to 11 credits):	
(a) FOR 464 Forest Resource Economics (W)	3
SOC 452 Environment and Society	3
(b) FW 424 Population Analysis and Management	4
FW 444 Conservation Biology	3

- (c) FW 410 Upland Ecosystem Management 3
- FW 417 Wetland Ecology and Management 3
- Students who elect Sociology 452 must also complete Sociology 452L to meet requirement 4. a. (3) (a).

5. **Physical Science** 31

- a. A minimum of 31 credits from the courses listed below including:
 - (1) The following course:
 - LB 220 Calculus III 4
 - (2) At least 27 credits in chemistry courses, in physics courses, or in chemistry and physics courses approved by the student's academic advisor. At least 20 of the 27 credits must be in courses at the 300 level or above, and at least 14 of the 27 credits must be in **either** chemistry courses or physics courses and must meet the conditions specified below:
 - For students who elect to complete at least 14 credits in chemistry courses**, at least 4 of the 14 credits must be laboratory credits at the 300–400 level.
 - For students who elect to complete at least 14 credits in physics courses**, at least 6 of the 14 credits must be in modern physics, and at least 3 of the 14 credits must be laboratory credits.

6. **History, Philosophy and Sociology of Science** 24

- a. A minimum of 24 credits in 300–400 level science and technology studies courses approved by the student's academic advisor. Courses in the Lyman Briggs College CORE PROGRAM and Lyman Briggs 492 may not be used to satisfy this requirement. Courses outside Lyman Briggs College may be used to satisfy this requirement.

Insert ①

MINOR IN HISTORY, PHILOSOPHY, AND SOCIOLOGY OF SCIENCE

The Minor in History, Philosophy, and Sociology of Science, which is administered by Lyman Briggs College, is designed to increase students understanding of the epistemological foundations and ethical elements of science while learning more of the history of some areas of science and appreciating the complex ways that science is connected to other social institutions and practices.

The minor is available as an elective to students who are enrolled in a bachelor's degree program in Lyman Briggs College at Michigan State University. Students majoring in History, Philosophy, and Sociology of Science in Lyman Briggs College are not eligible for the minor. With the approval of the college, the courses that are used to satisfy the minor may also be used to satisfy the requirements for the bachelor's degree. At least 12 unique credits counted towards the requirements for a student's minor must not be used to fulfill the requirements for that student's major.

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

Requirements for the Minor in History, Philosophy, and Sociology of Science

				CREDITS
Complete 15 to 16 credits from the following:				
1.	Two of the following courses (8 credits):			
	LB	330	Topics in History, Philosophy, and Sociology of Science (W)	4
	LB	331	Literature and Science (W)	4
	LB	332	Technology and Culture (W)	4
	LB	333	Topics in History of Science (W)	4
	LB	334	Science, Technology, and Public Policy (W)	4
	LB	335	The Natural Environment: Perceptions and Practices (W)	4
	LB	336	Gender, Sexuality, Science, Technology (W)	4
	LB	355	Philosophy of Technology (W)	4
	LB	490E	Advanced Directed Study in History, Philosophy, and Sociology of Science (W)	4
2.	Two of the following courses (7 or 8 credits):			
	ENG	473A	Literature and Medicine	3
	ESA	430	Environmental and Natural Resource Law	3
	ESA	440	Environmental and Natural Resource Policy in Michigan	3
	GEO	435	Geography of Health and Disease	3
	HST	416	History of the Atomic Bomb and Nuclear Culture	3
	HST	420	History of Sexuality since the 18 th Century	3
	HST	425	American and European Health Care since 1800	4
	HRT	486	Biotechnology in Agriculture: Applications and Ethical Issues	3
	LB	330	Topics in History, Philosophy, and Sociology of Science (W)	4
	LB	331	Literature and Science (W)	4
	LB	332	Technology and Culture (W)	4
	LB	333	Topics in History of Science (W)	4
	LB	334	Science, Technology, and Public Policy (W)	4
	LB	335	The Natural Environment: Perceptions and Practices (W)	4
	LB	336	Gender, Sexuality, Science, Technology (W)	4
	LB	355	Philosophy of Technology (W)	4
	LB	490E	Advanced Directed Study in History, Philosophy, and Sociology of Science (W)	4
	MC	350	Evolution and Society	4

MC	351	Science and Social Policy	4
MC	459	Science, Technology, Environment and Public Policy Capstone (N)	3
PHL	380	Nature of Science	3
PHL	462	Philosophy of Mind	3
PHL	480	Philosophy of Science	4
PHL	484	Philosophy of Biological Science	3
PHL	485	Philosophy of Social Science	3
SOC	368	Science, Technology, and Society	3
SOC	452	Environment and Society	3
SOC	452L	Internship in Environment and Society	1
SOC	475	Sociology of Health Care Systems	3
SOC	476	Social Psychology of Health	3
ZOL	446	Environmental Issues and Public Policy	3

Courses used to fulfill requirement 1. above may not be used to fulfill this requirement. Other courses may be used in fulfillment of this requirement with the approval of the student's academic advisor.