

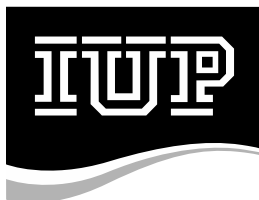
UNDERGRADUATE CATALOG 2017–18

COLLEGE OF NATURAL SCIENCES AND
MATHEMATICS

www.iup.edu/natsciandmath

This document is a direct extract from the full 2017–18 *Undergraduate Catalog*. As a result, the original page numbering will appear.

For information on other colleges at IUP, or about specific courses, please consult the full 2017–18 catalog, available at www.iup.edu/registrar/catalog. Earlier catalogs are also available at this web address.



Indiana University of Pennsylvania

The College of Natural Sciences and Mathematics

Deanne L. Snavely, Dean

Aleksandra B. Kaniasty, Assistant Dean

Daniel A. Burkett, Dean's Associate for Academic Affairs

Website: www.iup.edu/natsciandmath

We change lives through science and math. Our graduates change the world as educators, scientists, and leaders.

We change lives through:

- opportunities to explore, create, and innovate,
- team-based problem-solving in teaching and learning,
- interdisciplinary scientific research, and
- challenges that inspire individual achievement.

These four mission objectives encompass the College of Natural Sciences and Mathematics' (CNSM) approach for education of its students now and in the future. New scientific and mathematical methods often arise through an integration of qualitative and quantitative concepts to identify patterns and processes. Thus, progress in the natural sciences and mathematics is maximized through interdisciplinary-collaborative teams built on separate and specific knowledge and approaches of their respective disciplines. Scientific endeavors increasingly depend on this integrative approach that includes interconnecting scientific theory, experimentation, and simulation. Solutions to the problems facing future generations will involve ever larger and more complex databases capturing information of ever finer resolution. The college's graduates become responsible lifelong learners, applying lessons learned in the natural sciences and mathematics to their professional and personal lives, changing the world as educators, scientists, and leaders.

Degrees Offered

- Biochemistry
- Biology (Tracks available: Cell and Molecular; Ecology, Conservation, and Environmental Biology; Environmental Health; Pre-medical; Pre-veterinary; Honors)
- Biology Education
- Chemistry (Tracks available: Interdisciplinary Chemistry, Pre-medical, and Pre-pharmacy)
- Chemistry Education
- Computer Science (Tracks available: Cyber Security, Languages and Systems, Software Engineering)
- Earth and Space Science Education
- Environmental Engineering
- Geology (Tracks available: Geology, Energy Resources, Environmental)
- Mathematics (Tracks available: Actuarial, Applied)
- Mathematics Education
- Natural Science (Tracks available: Pre-audiology, Pre-chiropractic, Pre-dentistry, Pre-optometry, Pre-pharmacy, Pre-physical Therapy, Pre-physician Assistant, Pre-podiatry)
- Physics (Tracks available: Applied Physics, Nanomanufacturing Technology, Pre-engineering)
- Physics Education
- Psychology (Track available: Honors)
- Public Health (Tracks available: Environmental and Occupational Health, Behavioral and Mental Health, and Epidemiology and Biostatistics)

Degree Requirements

In addition to the university's Liberal Studies requirements, all students seeking a baccalaureate degree in the CNSM must complete the requirements for a major as established by the department through which they wish to specialize. Statements of these requirements and those for minoring in a specific field appear in the department sections that follow. A double major or minor may encompass a discipline outside as well as within the college but should be selected only with advisor approval. As a general principle, there is considerable latitude in course choice for Natural Sciences and Mathematics majors; for specifically required courses, substitution in any

program must have the written approval of the student's department chairperson or the college dean.

Degrees

The departments of Biology, Chemistry, and Computer Science offer work leading to either a bachelor of science or a bachelor of arts degree, depending on the specific course program pursued. The bachelor of science degree is awarded for successful work in the departments of Geoscience, Mathematics, Natural Science, and Physics. The bachelor of arts degree is awarded by the Department of Psychology.

Several departments in the college sponsor master of science, or professional science master's degrees. The Department of Psychology offers the doctor of clinical psychology degree. Information on these programs can be obtained from the School of Graduate Studies and Research.

Minors

Each department in the college offers a minor in their discipline. In addition, departments in the college participate in cross-disciplinary minors in Child and Adult Advocacy Studies (CAAST), Effective Teamwork and Communication, Sustainability Studies, Forensic Biosciences, and Cyber Security. The requirements for all minors are in the college and departmental sections that follow.

The Foreign Language Requirement

Several programs require some level of foreign language competency. See individual program requirements for more information.

Any foreign student, registered as such at IUP, whose acquired native language is other than English and who demonstrates an acceptable proficiency in English, is exempt from the foreign language requirement for a Natural Sciences and Mathematics degree if the department he/she is majoring in does not require a specific language not thus covered.

Internship Programs

Several departments in the CNSM have established extensive internship programs under which students engage in an off-campus supervised work experience for credit. For more information about specific internship programs, students should consult with the chairperson of the department in which the student is majoring. Students eligible for internships may receive federal or state funding.

Preprofessional Programs

The college offers programs for the preparation of students for acceptance by a professional school: pre-medical (including osteopathic medicine) and pre-veterinary medicine. In addition, the college offers a major in the natural sciences for those students whose goal is audiology, dentistry, pharmacy or pharmacology, optometry, podiatry, chiropractic medicine, physician assistant or physical therapy. All programs are so designed that, should work at a professional school not ensue, the student may earn an IUP baccalaureate degree, provided he/she has been faithful to faculty advisement.

The preprofessional health programs in the college presuppose that the student has an excellent background in the high school sciences and mathematics and will prove to be an excellent college student. Students should identify their proposed field of study upon admission to IUP.

Cooperative Programs

IUP has been fortunate to enter into cooperative agreements with a number of outstanding institutions to provide significant career opportunities to students. These formal agreements provide for accelerated graduate or professional degree programs or carefully planned and coordinated undergraduate programming with the cooperating institution. Programs are intended to

ensure acceptance of properly qualified students by the cooperating professional schools. Additional information about specific programs can be found under the appropriate academic department in this catalog.

- **Chiropractic** (See Natural Science): The New York Chiropractic College, Palmer Chiropractic College, Sherman College of Straight Chiropractic, Parker College of Chiropractic, and Logan Chiropractic College programs are designed to accelerate professional training of IUP students in the field of chiropractic medicine.
- **Dentistry** (see Natural Science): The Temple University School of Dentistry program is designed to accelerate the professional training of IUP students in the field of dentistry.
- **Jefferson Medical College, Physician Shortage Area Program** (See Department of Biology): The program increases the opportunities for IUP students to be admitted to Jefferson Medical College.*
- **Lake Erie College of Osteopathic Medicine (LECOM)** (See Department of Biology): LECOM and IUP have a cooperative “3+4” program. Students will be awarded a BS degree with a major in biology from IUP upon successful completion of the first-year curriculum at LECOM and of the undergraduate requirements at IUP.*
- **Optometry** (See Natural Science): The Pennsylvania College of Optometry program accelerates the professional training of IUP students in the field of optometry.
- **Pharmacy** (see Natural Science): The Shenandoah University School of Pharmacy or LECOM School of Pharmacy programs are designed to accelerate the professional training of IUP students in the field of pharmacy.
- **Physical Therapy** (see Natural Science): The Gannon University School of Physical Therapy program is designed to enhance the professional training of IUP students in the field of physical therapy.
- **Podiatry** (See Natural Science): The Temple University School of Podiatric Medicine program accelerates the professional training of IUP students in the field of podiatry.
- **Primary Care Scholars Program**: This program enables the college to identify students with primary care potential and to provide these students with the opportunity to interact with primary care faculty, physicians, and medical students at the Pennsylvania State University College of Medicine for one week during the summer.*
- **Philadelphia College of Osteopathic Medicine (PCOM)** (See Department of Biology): PCOM has established this “3+4” Early Acceptance program with IUP. The program will enable students who have demonstrated academic excellence and a commitment to the practice of medicine to gain a provisional acceptance to PCOM. Students will be awarded a BS degree with a major in biology from IUP upon successful completion of the first-year curriculum at PCOM and the undergraduate requirements at IUP.*

*Contact the pre-medical advisor, N. Bharathan, for specific information.

Bachelor of Science—Environmental Engineering

Environmental Engineering is a multi-disciplinary program that prepares students to work to minimize the impact of human development and technology on the natural world. Their interests include water purification, pollution control, public health, recycling, waste disposal, and sustainable design and manufacturing. Graduates trained in basic sciences and mathematics will use the principles of engineering, geosciences, chemistry, biology, and physics to develop solutions to environmental problems. This degree program combines a solid grounding in college-level basic sciences and mathematics with environmental engineering and technical courses.

Graduates of the BS program in Environmental Engineering will be qualified to enter the workforce immediately or to further their educations in master’s or doctoral programs. The degree program will prepare students to apply mathematical and scientific principles to the design, development, and operational evaluation of systems for controlling contained living environments and for monitoring and controlling factors in the external natural environment, including pollution control, waste and hazardous material disposal, health and safety protection, conservation, life support, and requirements for protection of special materials and related work environments.

Graduates of this program will possess the technical expertise required to maintain a healthy balance between societal welfare, economic growth, and the environment surrounding us, and will be in demand in the Pennsylvania workforce where the need for environmental engineers is projected to grow faster than other occupations.

Bachelor of Science—Environmental Engineering

Liberal Studies: As outlined in the Liberal Studies section with the following specifications: 44

Humanities: PHIL 122

Mathematics: MATH 125

Natural Science: CHEM 111-112 or CHEM 113-114

Social Science: ECON 101; RGPL 103 or GEOG 104

Liberal Studies Electives: 3cr, MATH 126

Major: 58

Required Courses:

BIOL 202	Principles of Cell and Molecular Biology	4cr
GEOS 201	Foundations of Geology	4cr
MATH 171	Introduction to Linear Algebra	3cr
MATH 216	Probability and Statistics for Natural Sciences	3cr
MATH 225	Calculus III/Physics, Chemistry, Mathematics	3cr
MATH 341	Differential Equations	3cr
PHYS 131	Physics I-C Lecture	3cr
PHYS 132	Physics II-C Lecture	3cr
PHYS 141	Physics I-C Lab	1cr
PHYS 142	Physics II-C Lab	1cr

Environmental Engineering Core:

ECON 361	Environmental Economics	3cr
ENVE 101	Introduction to Environmental Engineering	3cr
ENVE 201	Fluid Mechanics	3cr
ENVE 211	Statics and Solid Mechanics	3cr
ENVE 301	Environmental Aquatic Chemistry	4cr
ENVE 311	Water Resources Engineering	4cr
ENVE 461	Water and Wastewater Treatment	3cr
ENVE 471	Solid and Hazardous Waste Management	3cr
ENVE 498	Environmental Engineering Design	3cr
SAFE 435	Ethics and Professionalism	1cr

Free Electives: 18

BIOL 221, 250, 323, 401, CHEM 231, 325, 351, COSC 110, 250, GEOG 316, 415, 419, GEOS 312, IFMG 110, 250, MATH 342, SAFE 310, 361 and foreign language intermediate sequence (6cr) are recommended.

Total Degree Requirements: 120

Bachelor of Science—Public Health

The Bachelor of Science with a major in Public Health will graduate students who will help meet Pennsylvania’s workforce needs in public health and health care related fields, and will help meet the strong demand for trained public health professionals projected by national and regional studies. This degree will prepare students for jobs in health administration, community health, and health education. Upon completion of the program, students will understand the science of human physical and mental health, the epidemiology of infectious and chronic diseases, as well as the complications of the US and global healthcare systems with regard to access and ethics of the disparities in health care delivery. The program offers three concentrations: **Environmental and Occupational Health, Behavioral and Mental Health, and Epidemiology and Biostatistics.**

Bachelor of Science—Public Health/Environmental and Occupational Health Concentration

Liberal Studies: As outlined in the Liberal Studies section with the following specifications: 46-47

Humanities: PHIL 122 or 130

Mathematics: MATH 217

Natural Science: BIOL 104, 119

Social Science: ANTH 110, PSYC 101, SOC 151		
Liberal Studies Electives: ECON 122, FDNT 145		
Public Health Core:		30-33
BIOL 301	Fundamentals of Epidemiology	3cr
ECON 360	Health Economics	3cr
GEOG/ RGPL 316	Introduction to Geographic Information Systems	3cr
NURS 410	Health Promotion and Social Issues	3cr
NURS 455	Health Care Informatics	3cr
NURS/ELR 314	Health Policy and Law	3cr
PUBH 122	Foundations of Public Health	3cr
PUBH 306	Research Design and Analysis in Public Health	3cr
PUBH 493	Internship in Public Health	3-6cr
SOC 442	Medical Sociology	3cr
Concentration: Environmental and Occupational Health		23
BIOL 221, 323; CHEM 101, 102; SAFE 330 or 430, 335, 361		
Free Electives: (1)		17-21
Total Degree Requirements:		120
(1) Minor or certificate recommended.		

Bachelor of Science—Public Health/Behavioral and Mental Health Concentration

Liberal Studies: As outlined in the Liberal Studies section with the following specifications:		46-47
Humanities: PHIL 122 or 130		
Mathematics: MATH 217		
Natural Science: BIOL 104, 119		
Social Science: ANTH 110, PSYC 101, SOC 151		
Liberal Studies Electives: ECON 122, FDNT 145		
Public Health Core:		30-33
BIOL 301	Fundamentals of Epidemiology	3cr
ECON 360	Health Economics	3cr
GEOG/ RGPL 316	Introduction to Geographic Information Systems	3cr
NURS 410	Health Promotion and Social Issues	3cr
NURS 455	Health Care Informatics	3cr
NURS/ELR 314	Health Policy and Law	3cr
PUBH 122	Foundations of Public Health	3cr
PUBH 306	Research Design and Analysis in Public Health	3cr
PUBH 493	Internship in Public Health	3-6cr
SOC 442	Medical Sociology	3cr
Concentration: Behavioral and Mental Health		18
PSYC 332 and 374; SOC 361 or 362 or 363; SOC 448 and 2 electives		
Free Electives: (1)		22-26
Total Degree Requirements:		120
(1) Minor or certificate recommended.		

Bachelor of Science—Public Health/Epidemiology and Biostatistics Concentration

Liberal Studies: As outlined in the Liberal Studies section with the following specifications:		46-47
Humanities: PHIL 122 or 130		
Mathematics: MATH 121		
Natural Science: BIOL 104, 119		
Social Science: ANTH 110, PSYC 101, SOC 151		
Liberal Studies Electives: ECON 122, FDNT 145		
Public Health Core:		30-33
BIOL 301	Fundamentals of Epidemiology	3cr
ECON 360	Health Economics	3cr

GEOG/ RGPL 316	Introduction to Geographic Information Systems	3cr
NURS 410	Health Promotion and Social Issues	3cr
NURS 455	Health Care Informatics	3cr
NURS/ELR 314	Health Policy and Law	3cr
PUBH 122	Foundations of Public Health	3cr
PUBH 306	Research Design and Analysis in Public Health	3cr
PUBH 493	Internship in Public Health	3-6cr
SOC 442	Medical Sociology	3cr
Concentration: Epidemiology and Biostatistics		23
CHEM 101, 102; FDNT 422; KHSS 472; MATH 216, 411, 412		
Free Electives: (1)		17-21
Total Degree Requirements:		120
(1) Minor or certificate recommended.		

Child and Adult Advocacy Studies (CAAST)

Child and Adult Advocacy Studies is an 18-credit interdisciplinary undergraduate minor. It is designed for current undergraduate students enrolled at IUP. It provides mandated reporters and first responders in criminology, education, family studies, medicine, nursing, psychology, public health, sociology, social work, and other disciplines with evidence-based, culturally relevant knowledge and skills to improve the outcomes for victims and perpetrators of interpersonal violence across the lifespan. A student's major determines which CAAST minor s/he pursues: one minor has been designed for Psychology majors, one minor has been designed for Sociology majors, and one minor has been designed for all other majors.

Minor—Child and Adult Advocacy Studies (CAAST) for Sociology/Human Services Track majors (1, 2, 3) 18

Required Courses:		
PSYC 101	General Psychology	*cr (4)
PSYC 313	Non-normative Development in Adulthood	
<i>or</i> 314	<i>or</i> Child and Adolescent Psychopathology	3cr
PSYC 322	Violence Across the Life Span	3cr
PSYC 332	Community Psychology and Prevention Science	3cr
PSYC 380	Gender and Violence	3cr
SOC 151	Principles of Sociology <i>or</i>	
<i>or</i> 161	<i>or</i> Foundations of Sociology: Social Relations in Groups and Organizations	*cr (4)
Controlled Electives:		
Two courses from the following: SOC 357, 427, 428		6cr
(1) Students majoring in Psychology are not eligible to take this minor; instead, they must take the CAAST minor that has been designed for students pursuing a major in Psychology.		
(2) Students who are Sociology/Human Services Track majors can only have two SOC courses that count for their major and the CAAST minor.		
(3) Sociology/General Track majors who wish to get a CAAST minor must take SOC 391 and 392 as part of their free electives.		
(4) Credits counted in Liberal Studies, not in the minor.		

Minor—Child and Adult Advocacy Studies (CAAST) for Psychology majors (1, 2) 18

Required Courses:		
PSYC 101	General Psychology	*cr (3)
PSYC 322	Violence Across the Life Span	3cr
SOC 151	Principles of Sociology <i>or</i>	
<i>or</i> 161	<i>or</i> Foundations of Sociology: Social Relations in Groups and Organizations	*cr (3)
SOC 391	Foundations of Sociological Practice	3cr
SOC 392	Clinical Sociological Practice	3cr

Controlled Electives:

One additional PSYC course from the following: PSYC 313, 314, 332, 380, 493	3cr
Two additional SOC courses from the following: SOC 357, 427, 428	6cr

- (1) Students majoring in Sociology/Human Services Track are not eligible to take this minor; instead, they must take the CAAST minor that has been designed for students pursuing a major in Sociology/Human Services Track.
- (2) Students who are Psychology majors can only have two PSYC courses that count for their major and the CAAST minor.
- (3) Credits counted in Liberal Studies, not in the minor.

Minor—Child and Adult Advocacy Studies (CAAST) for majors other than Psychology and Sociology 18**Required Courses:**

PSYC 101	General Psychology	*cr (1)
PSYC 322	Violence Across the Life Span	3cr
SOC 151	Principles of Sociology <i>or</i>	
<i>or</i> 161	Foundations of Sociology: Social Relations in Groups and Organizations	*cr (1)
SOC 391	Foundations of Sociological Practice	3cr
SOC 392	Clinical Sociological Practice	3cr

Controlled Electives: (2)

Three additional courses from the following: PSYC 313 <i>or</i> 314, 332, 380, SOC 357, 427, 428	9cr
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- (1) Credits counted in Liberal Studies, not in the minor.
- (2) With the aid of a CAAST minor advisor, students will select classes (a) from both PSYC and SOC, and (b) that will cover the spectrum of violence across the lifespan.

Certificate in Child and Adult Advocacy Studies (CAAST)

The CAAST Certificate is a 12-credit interdisciplinary program designed for individuals who are already working in professional environments and are seeking additional training/knowledge relevant to their work. It provides mandated reporters and first responders in child protection, child advocacy, criminal justice, domestic violence, education, medicine, nursing, older adult protective services, older adult advocacy, psychology, sociology, social work, and other disciplines with evidence-based, culturally relevant knowledge and skills to improve the outcomes for victims and perpetrators of interpersonal violence across the lifespan.

Certificate—Child and Adult Advocacy Studies (CAAST) 12

Prerequisite: Program Coordinator(s) approval

Required Course:

PSYC 322	Violence Across the Life Span	3cr
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Controlled Electives:

One additional PSYC course from the following: PSYC 313, 314, 332, 380	3cr
Two additional SOC courses from the following: SOC 357, 427, 428	6cr

Effective Teamwork and Communication Minor

The Effective Teamwork and Communication minor is an interdisciplinary program that aims to better prepare students for a competitive job market by instilling interpersonal, teamwork, and communication skills for use in their field. Employers of today seek job candidates who possess a strong set of technical skills, but strongly prefer someone who can also work in a team environment. Ninety percent of employers believe that team skills are equally or even more important than technical skills when hiring. This minor provides students with ways to stand out from the crowd.

The addition of the minor is practical for all majors, particularly those programs with few free electives. The minor draws expertise from appropriate

faculty across the university to introduce and relate in-demand teamwork attributes to core foundation theories of communication, leadership, sociology, and theater. Students further develop their teamwork and communication skills as they solve current, real-world problems in in-major projects within their required classes. The direct connections of the liberal courses and in-major course work minimizes the course load for students who wish to enhance their education and future job prospects and emphasizes the application of a liberal studies education.

The course work of the minor will expose students to understanding how their beliefs, attitudes, and actions affect the team as well as how the diversity of the team adds strength and additional perspective to solve complex problems facing society. Students will learn how to engage audiences with nontechnical and technically rich content, frame and present arguments, and develop the ability to speak about their work and its significance. Traits of good team members and leaders will be examined. Capstone projects, coupled with required in-major courses, provide a direct opportunity for students to develop their skills within their chosen field. Students will reflect on the personal qualities and attributes they bring to a team and prepare materials that best illustrate these skills to future employers.

Minor—Effective Teamwork and Communication 18-20**Required Courses:**

COMM 261	Teamwork and Communication Skills for College and Career (1)	3cr
LDSP 361	Introduction to Leadership	3cr
SOC 161	Foundations of Sociology: Social Relations in Groups and Organizations (2, 3)	3cr
THTR 161	Introduction to Theater: Interpersonal Practices (4)	3cr

Interdisciplinary Teamwork Course: (5)

One course approved as a Teamwork-Intensive section (T-Course) course. 3-4cr

Capstone Courses: (6)

TMWK 461	Teamwork and Communication in Research (7)	1cr
And one to two credits of independent study, honors thesis, or undergraduate research (8)		1-2cr

- (1) COMM 261 counts as a Liberal Studies Elective in Oral Communication and Information Literacy requirements.
- (2) SOC 161 counts toward the Liberal Studies Social Science requirement.
- (3) SOC 161 and 151 are interchangeable for pass/repeat. SOC 161 is required for the minor.
- (4) THTR 161 counts toward the Liberal Studies Fine Arts requirement. THTR 161 and 101 are interchangeable for pass/repeat. THTR 161 is required for the minor.
- (5) Any teamwork-intensive course can count towards a student's minor. Students are encouraged to take a teamwork-intensive course that is a required course or elective in their major.
- (6) Students need a minimum 6cr of 300- and 400-level course work. This requirement is completed using one of the two following approaches: 1) LDSP 361 and a 3cr 300- or 400-level teamwork intensive course or 2) LDSP 361, TMWK 461, and 2cr of a 300- or 400-level independent studies/honors thesis/undergraduate research.
- (7) TMWK 461 is a required course for the minor. The independent studies/honors thesis/undergraduate research course is a co-requirement (or may be taken as a prerequisite) for TMWK 461.
- (8) Students who take a 3cr teamwork-intensive course need 2cr of independent study, honors thesis, or undergraduate research.

Sustainability Studies Minor

Jonathan Warnock, College Contact

The Sustainability Studies minor is an interdisciplinary program that draws from expertise across the university. The program conceptualizes "sustainability" as an interdisciplinary approach to knowledge production and action that focuses on "the health and integrity of human societies and the

natural world.” Sustainability is classically defined as a stool with three legs—the social, the economic, and the environmental; the purpose of this program is to address the challenges of sustainability by balancing the humanities, social sciences, and natural sciences. The minor equips students to broaden their thinking about the origins of sustainability problems and possible solutions to include human institutions, ethics and cultures, as well as technologies and natural sciences. In so doing, the minor aims to foster student agency with regard to research on sustainability, responsibility to both human and non-human life, and civic engagement with local sustainability projects. The minor can supplement all majors in the university. Career possibilities include positions in design, law, food industries, planning and architecture, education, building certification, renewable energy, and waste management.

Students must complete 18 credits and a capstone experience (described below) to earn a minor in sustainability studies. The program’s interdisciplinary approach encourages students to take courses from a variety of departments. The program is structured as follows:

1. All students will take SUST 201 Introduction to Sustainability.
2. Students must then take at least 12 credits from Category A, defined as courses in which substantial content is foundational to engagement with sustainability. These credits must be distributed across three “clusters,” each of which denotes a major aspect of sustainability. Having taken one course from each of the three clusters, students will then be able to take the remaining Category A credits from a cluster of their choosing.
3. Only 3cr may come from Category B, defined as courses in which significant content is foundational to engagement with sustainability. Because their content may vary, courses from Category B must be approved by the program director to count for the minor.
4. At least 6cr must be at the 300 level or above.
5. Only one course may come from the student’s major.
6. With the exception of SUST courses, no course prefix may be used more than twice without written permission from the program director.
7. Special topics, independent study courses, and internship courses may be applied to either Category A or Category B with the approval of the Sustainability Studies Committee.
8. Students should consult with the program director to determine if there are any prerequisites for the courses. Through counseling, the program coordinator will work with individual departments to determine if students may qualify for prerequisite exemptions.
9. Students will work with an advisor from the Sustainability Studies program to develop a capstone experience that synthesizes their knowledge and skills related to sustainability. This requirement may be fulfilled by one of the following options: a portfolio, conference presentation, or other scholarly activity approved by the program director.

Minor—Sustainability Studies 18

Required course: 3

SUST 201 Introduction to Sustainability 3cr

Category A 12-15

Cluster I: Ethics, Culture, and Society

ANTH 420 Environmental Anthropology 3cr
 ANTH 430 Anthropology of Food 3cr
 ENGL 361 Environmental Literature 3cr
 HIST 385 People in Nature 3cr
 PHIL 270 Ethics and the Environment 3cr
 RLST 365 Native North American Religions 3cr

Cluster II: Natural Sciences and Environmental Stewardship

BIOL 103 Life on Earth 4cr
 BIOL 114 Environmental Science 3cr
 BIOL 115 Biotic Diversity of North America 3cr
 BIOL 201 Principles of Ecology and Evolution 4cr
 BIOL 221 Environmental Health and Protection 4cr
 BIOL 272 Conservation of Plant and Animal Resources 3cr
 BIOL 450 Field Biology at Pymatuning Laboratory of Ecology 4cr
 BIOL 490 Field Studies in Biology 3cr
 GEOS 101 The Dynamic Earth 3cr

GEOS 103 Oceans and Atmospheres 3cr
 GEOS 310 Environmental Geology 4cr
 GEOS 370 Oceanography 4cr
 PHYS 101 Energy and Our Environment 3cr
 PSYC 331 Environmental Psychology 3cr

Cluster III: Environmental Policy, Economics, and Law

CRIM 374 Environmental Crime and Justice 3cr
 ECON 361 Environmental Economics 3cr
 FDNT 470 Human Food Consumption Patterns 3cr
 GEOG/RGPL 103 Global Cities: Issues in Planning and Development 3cr
 GEOG 104 World Geography: Global Context 3cr
 GEOG/RGPL 343 Geography of Fresh Water Resources 3cr
 GEOG/RGPL 345 Biogeography for Environmental Managers 3cr
 GEOG/RGPL 440 Conservation: Environmental Analysis 3cr
 MKTG 444 Green Marketing 3cr
 RGPL 426 Environmental Land Use Planning 3cr

Category B

0-3

ANTH 110, 213, 314, 444, ART 113, 213, BIOL 323, 362, 456, 460, ECON 338, 339, 365, GEOG 230, 435, GEOS 150, 152, 201, 324, JRNL 375, 466, KHSS 143, NURS 143, PHIL 122, PLSC 250, 389, PSYC 330, RLST 485, SOC 314, 337, 340, 417