

with the director of the NRCR Program, or participate in a project organized and convened by faculty. Projects may be conducted year-round. Level: Graduate

#### ENST 580 - The Politics of Food

Credits: 3. Offered intermittently. This seminar explores social, economic, and ecological issues related to the contemporary food and agricultural system and alternatives to that system. Level: Graduate

#### ENST 590 - Supervised Internship PEAS

Credits: 0 TO 8. (R-8) Spring and autumn, 2 cr.; summer intensive, 3 cr. Prereq., graduate standing. Students learn small scale sustainable vegetable farming in a hands-on work environment at the PEAS farm (15 minute bike ride from campus). Lectures, readings and reflection inform the work. Summer students also visit local farms on a once-a-week field trips. PEAS is repeatable, as the curriculum changes across the season, and students can attend any semester, though the 3 credit (grad level) summer intensive course is the heart of the program. Level: Graduate

#### ENST 593 - Professional Paper

Credits: 1 TO 6. (R-6) Offered autumn and spring. Prereq., graduate standing in EVST and consent of instructor. Preparation of a professional paper appropriate to the needs and objectives of the individual student. Level: Graduate Course Attributes: Faculty-Led Study Abroad

#### ENST 594 - Graduate Seminar

Credits: 1 TO 15. (R-15) Offered autumn and spring. Prereq., graduate standing. May be restricted to EVST majors. May require consent of instructor. In-depth analysis of a current environmental topic. Different topics offered each semester. Level: Graduate

#### ENST 595 - Special Topics

Credits: 1 TO 9. (R-9) Offered autumn and spring. Prereq., graduate standing. May be restricted to EVST majors. May require consent of instructor. Experimental offerings of visiting professors, of new courses, or one-time offerings of current topics. Level: Graduate Course Attributes: Internships/Practicums

#### ENST 596 - Independent Study

Credits: 1 TO 12. (R-12) Offered autumn and spring. Prereq., graduate standing in EVST and consent of instructor. Work on selected problems by individual students under direct faculty supervision. Level: Graduate Course Attributes: Service Learning/Volunteer

#### ENST 597 - Research

Credits: 1 TO 12. (R-12) Offered autumn and spring. Prereq., graduate standing in EVST and consent of instructor. Directed individual graduate research and study appropriate to background and objectives of the student. Level: Graduate

#### ENST 598 - Internship

Credits: 1 TO 8. (R-8) Offered autumn and spring. Prereq., graduate standing in EVST and consent of instructor. Practical application of classroom learning during placements off campus. Level: Graduate Course Attributes: Internships/Practicums

#### ENST 599 - Thesis

Credits: 1 TO 6. (R-6) Offered autumn and spring. Prereq., graduate standing in EVST and consent of instructor. Preparation of a thesis or manuscript based on research for presentation and/or publication. Level: Graduate

# Geography Department

## **Christiane von Reichert, Chair**

Whether global climate change or local land use change – geography provides an understanding of complex natural, social, and human-environmental processes at different geographic scales. Drawing on and expanding the knowledge base of Natural Sciences, Social Sciences, and Geographic Information Sciences, we focus on Mountain Studies, Community and Environmental Planning, and Geographic Information Systems.

Our graduates are successful in occupying meaningful and challenging positions in public, private, and non-profit sectors. Their contributions speak to the impacts Geographers have in analyzing, understanding, and shaping our natural and human landscapes for the benefit of future generations.

The Department of Geography offers the Bachelor of Arts, Bachelor of Science, Master of Arts, and Master of Sciences degrees in geography. For a B.A. in geography, an option in community and environmental planning is available. For a B.S. in geography an option in physical geography is available. Also offered are a minor in geography and a teaching major and minor in geography. Several interdisciplinary minors are available to students: a minor in mountain studies, a minor in climate change and a minor in international development studies. See the [Graduate School website](#) for more information concerning the M.A. and M.S. programs.

A certificate in GIS Sciences and Technologies, jointly offered by the Department of Geography (College of Humanities and Sciences) and the Department of Forest Management (College of Forestry and Conservation), is also available. This GIST certificate is a complement to an existing major or to a bachelor's degree already obtained. For details, please see below or the [GIST website](#).

## **College Humanities & Sciences      Catalog Year: 2015-2016**

Degree Type: Bachelor of Arts      Level: **Major**    Subject: **Geography**

Total Credits: 36      Cumulative GPA Required: 2.5

The general geography B.A. degree (without option) is very flexible. In addition to meeting the core requirements for all geography majors, students may take a wide range of electives in geography (minimum 11, maximum 35 elective credits). Electives may be chosen from the fields of regional geography, geographic methods and techniques, or systematic geography (physical geography, human-environment interaction, or geography and society).

### Lower Division Core

Category Name: Introduction to Geography Rule: Must complete all of the following courses:

Criterion: C-    Number of Credits 7

#### Course Listing

GPHY 111N    Intro to Physical Geography    3

GPHY 112N    Intro to Phys Geography Lab    1

GPHY 121S    Human Geography    3

Commentary: Lower Division Core

Category Name: Regional Geography Course

Rule: Must complete at least 1 of the following courses

Criterion: C-    Number of Credits 3

#### Course Listing

GPHY 141S    Geography of World Regions    3

GPHY 144    Montana's Mountains    3

GPHY 241    Montana    3

GPHY 243X    Africa    3

GPHY 245X    The Middle East    3

GPHY 342    North America    3

GPHY 344    Crown of the Continent    3

GPHY 347    Regional Geography (Mult Reg)    3

GPHY 348    Field Studies in Geography    3

GPHY 442    Regionalism & Rocky Mtn West    3

GPHY 444 High Asia 3

GPHY 445 Regional Geography 3

Lower Division Core

Category Name: Geographic Methods

Rule: Must complete all of the following courses

Criterion: C- Number of Credits 6

Course Listing

GPHY 284 Intro to GIS and Cartography 3

GPHY 385 Field Techniques 3

Commentary: Upper Division Core

Category Name: Upper Division Systematic Geography Rule: Must complete the following subcategories of courses

Criterion: C- Number of Credits 9

Course Listing Commentary:

Subcategory Name: Physical Geography

Rule: Must complete at least 1 of the following courses

Criterion: C- Number of Credits 3

Course Listing

ERTH 303N Weather and Climate 3

GPHY 311N Biogeography 3

GPHY 314 Global Mountain Environments 3

GPHY 317 Geomorphology 3

GPHY 438 Mountain Field Study 3

GPHY 525 Adv Physical Geography 3

Subcategory Name: Geography and Society Rule: Must complete at least 1 of the following:

Criterion: C- Number of Credits 3

Course Listing

GPHY 323S Econ. Geog. of Rural Areas 3

GPHY 421 Sustainable Cities 3

GPHY 434 Food and Famine 3

GPHY 443 Cultural & Global Competence 3

GPHY 515 Adv Human Geography 3

Subcategory Name: Human Environment Interaction Rule: Must complete at least 1 of the following:

Criterion: C- Number of Credits 3

Course Listing

GPHY 335 Water Policy 3

GPHY 336 Exploration & Discovery 3

GPHY 338 Mountains and Society 3

GPHY 432 Human Role Environ Change 3

GPHY 433 Cultural Ecology 3

Commentary: Major Electives

Category Name: Degree Electives

Rule: Must complete 10 credits of GPHY electives to fulfill the 36 degree credit total  
Criterion: C- Number of Credits 10

## Course Listing

Commentary: Students must fulfill the degree credit total of 36 credits plus the university requirement for 39 upper division credits.

Commentary: Capstone

Category Name: Capstone

Rule: Seniors must complete the following course

Criterion: C- Number of Credits 1

## Course Listing

GPHY 400 Geography Capstone 1

Commentary: Seniors must enroll in GPHY 400 in fall, attend GPHY 500 in fall, and complete course requirements in spring.

## Upper Division Writing

Category Name: Upper Division Writing

Rule: Must complete 1 of the following courses

Criterion: C- Number of Credits 3

## Course Listing

GPHY 335 Water Policy 3

GPHY 433 Cultural Ecology 3

GPHY 499 senior thesis / capstone 3

Commentary: GPHY 335 or GPHY 433 will also count toward the upper division core requirements GPHY 499 will also count toward upper division elective credits.

## Degree Specific Mathematics

Category Name: General Ed Mathematics Rule: Must complete 1 of the following

Criterion: C- Number of Credits 3

## Course Listing

M 115 Probability and Linear Math 3

M 121 College Algebra 3

M 151 Precalculus 4

M 162 Applied Calculus 4

Commentary: Students are encouraged to take M 115. Students who successfully complete M 122 Trigonometry, M 171 Calculus I, or M 172 Calculus II also meet the degree specific Gen Ed Mathematics requirement. Gen Ed credits do not count towards degree credits.

Commentary: Degree Commentary

## **College Humanities & Sciences Catalog Year: 2015-2016**

Degree Type: Bachelor of Arts Level: Major Subject: **Geography** Option: **Community & Environmental Plng**

Total Credits: 43 Cumulative GPA Required: 2.5

## Lower Division Core

Category Name: Introduction to Geography Rule: Must complete all of the following courses:

Criterion: C- Number of Credits 7

## Course Listing

GPHY 111N Intro to Physical Geography 3

GPHY 112N Intro to Phys Geography Lab 1

GPHY 121S Human Geography 3

Commentary: Lower Division Core

Category Name: Regional Geography Course

Rule: Must complete at least 1 of the following courses

Criterion: C- Number of Credits 3

Course Listing

GPHY 141S Geography of World Regions 3

GPHY 144 Montana's Mountains 3

GPHY 241 Montana 3

GPHY 243X Africa 3

GPHY 245X The Middle East 3

GPHY 342 North America 3

GPHY 344 Crown of the Continent3

GPHY 347 Regional Geography (Mult Reg) 3

GPHY 348 Field Studies in Geography 3

GPHY 442 Regionalism & Rocky Mtn West 3

GPHY 444 High Asia 3

GPHY 445 Regional Geography 3

Commentary: Lower Division Core

Category Name: Methods

Rule: Must complete all of the following courses

Criterion: C- Number of Credits 10

Course Listing Commentary:

Subcategory Name: Geographic Methods Rule:

Criterion: C- Number of Credits 6

Course Listing

GPHY 284 Intro to GIS and Cartography 3

GPHY 385 Field Techniques 3

Commentary:

Subcategory Name: Mathematics/Statistics Rule:

Criterion: C- Number of Credits 4

Course Listing

STAT 216 Introduction to Statistics 4

Commentary:

Upper Division Core

Category Name: Upper Division Systematic Geography Rule: Must complete the following subcategories of courses

Criterion: Number of Credits 9

Course Listing Commentary:

Subcategory Name: Physical Geography

Rule: Must complete at least 1 of the following courses

Criterion: C- Number of Credits 3

Course Listing

ERTH 303N Weather and Climate 3

GPHY 311N Biogeography 3  
GPHY 314 Global Mountain Environments3  
GPHY 317 Geomorphology 3  
GPHY 438 Mountain Field Study 3  
GPHY 525 Adv Physical Geography 3

Commentary:

Subcategory Name: Geography and Society Rule: Must complete at least 1 of the following:

Criterion: C- Number of Credits 3

Course Listing

GPHY 323S Econ. Geog. of Rural Areas 3  
GPHY 421 Sustainable Cities 3  
GPHY 434 Food and Famine 3  
GPHY 443 Cultural & Global Competence 3  
GPHY 515 Adv Human Geography 3

Commentary: GPHY 323S and 421 count simultaneously toward Upper Division Systematic Geography and CEP electives.

Subcategory Name: Human Environment Interaction Rule: Must complete at least 1 of the following:

Criterion: C- Number of Credits 3

Course Listing

GPHY 335 Water Policy 3  
GPHY 336 Exploration & Discovery 3  
GPHY 338 Mountains and Society 3  
GPHY 432 Human Role Environ Change 3  
GPHY 433 Cultural Ecology 3

Commentary: GPHY 335 and 432 count simultaneously toward Upper Division Systematic Geography and CEP electives.

Commentary:

Capstone

Category Name: Capstone

Rule: Seniors must complete the following course

Criterion: C- Number of Credits 1

Course Listing

GPHY 400 Geography Capstone 1

Commentary: Seniors must enroll in GPHY 400 in fall, attend GPHY 500 in fall, and complete course requirements in spring.

Commentary: Upper Division Writing

Category Name: Upper Division Writing

Rule: Must complete 1 of the following courses

Criterion: C- Number of Credits 3

Course Listing

GPHY 335 Water Policy 3  
GPHY 433 Cultural Ecology 3  
GPHY 499 senior thesis / capstone 3

Commentary: GPHY 335 or GPHY 433 will also count toward the upper division core requirements

Commentary: Option Requirements

Category Name: Community and Environmental Planning Option Rule: Must complete the following subcategories

Criterion: Number of Credits 13-20

Course Listing Commentary:

Subcategory Name: Community and Environmental Planning Core Rule: Must complete both courses

Criterion: C- Number of Credits 6

Course Listing

GPHY 465 Planning Princ & Processes 3

GPHY 466 Environmental Planning 3

Subcategory Name: Community and Environmental Planning Methods Rule: Must complete at least 1 of the following course/lab combinations

Criterion: C- Number of Credits 4

Course Listing

GPHY 468 Community & Regional Analysis 3

GPHY 469 Planning & Analysis Laboratory 1

GPHY 486 Transport, Planning & GIS 3

GPHY 489 Cartography/GIS Laboratory 1

Commentary: GPHY 468 must be taken together with GPHY 469. GPHY 486 must be taken together with GPHY 489.

Subcategory Name: Community and Environmental Planning Electives Rule: Must complete at least 3 courses from the following courses:

Criterion: C-

Course Listing Number of Credits 3-10

GPHY 323S Econ. Geog. of Rural Areas 3

GPHY 335 Water Policy 3

GPHY 421 Sustainable Cities 3

GPHY 432 Human Role Environ Change 3

Commentary: If not previously taken to fulfill CEP Methods, the following courses can be selected as electives:

- 1) GPHY 468/469 Community and Regional Analysis with co-requisite lab - 4 cr
- 2) GPHY 486/489 Transport, Planning & GIS with co-requisite lab = 4 cr Other courses can count towards CEP electives.

GPHY 323S and GPHY 421 can be used to satisfy upper division requirements in 'Geography and Society'

GPHY 335 and GPHY 432 can be used to satisfy upper division requirements in 'Human Environment Interaction.'

Degree Specific Mathematics

Category Name: General Ed Mathematics Rule: Must complete 1 of the following

Criterion: C- Number of Credits 3

Course Listing

M 115 Probability and Linear Math 3

M 121 College Algebra 3

M 151 Precalculus 4

M 162 Applied Calculus 4

Commentary: Students are encouraged to take M 115. Students who successfully complete M 122 Trigonometry, M 171 Calculus I, or M 172 Calculus II also meet the degree specific Gen Ed Mathematics requirement. Gen Ed credits do not count towards degree credits.

Commentary: Degree Commentary

An internship is strongly recommended.

## **College Humanities & Sciences      Catalog Year: 2015-2016**

Degree Type: Bachelor of Science      Level: **Major**      Subject: **Geography**

Total Credits: 36      Cumulative GPA Required: 2.5

The B.S. in Geography is designed to accommodate those students who are interested in pursuing more science-based and technical areas of study and work in the field of Geography, such as aspects involving physical geography and geospatial technologies, or environmental planning. Those pursuing a geography B.S. degree (with or without an option) must complete 6-10 additional credits (a two-course sequence) of science coursework. The classes must be selected and approved by the student and advisor as appropriate to individual student goals (e.g., BIOO 105N (BIOL 120N), BIOE 172N (BIOL 121)).

Lower Division Core

Category Name: Introduction to Geography Rule: Must complete all of the following courses:

Criterion: C-      Number of Credits 7

Course Listing

GPHY 111N    Intro to Physical Geography    3

GPHY 112N    Intro to Phys Geography Lab    1

GPHY 121S    Human Geography    3

Commentary: Lower Division Core

Category Name: Regional Geography Course

Rule: Must complete at least 1 of the following courses

Criterion: C-      Number of Credits 3

Course Listing

GPHY 141S    Geography of World Regions    3

GPHY 144      Montana's Mountains    3

GPHY 241      Montana    3

GPHY 243X    Africa    3

GPHY 245X    The Middle East    3

GPHY 342      North America    3

GPHY 344      Crown of the Continent    3

GPHY 347      Regional Geography (Mult Reg)    3

GPHY 348      Field Studies in Geography    3

GPHY 442      Regionalism & Rocky Mtn West    3

GPHY 444      High Asia    3

GPHY 445      Regional Geography    3

Commentary: Lower Division Core

Criterion: C-      Number of Credits 6

Course Listing

GPHY 284      Intro to GIS and Cartography    3



GPHY 385 Field Techniques 3

Commentary: Upper Division Core

Category Name: Upper Division Systematic Geography Rule: Must complete the following subcategories of courses

Criterion: C- Number of Credits 9

Course Listing Commentary:

Subcategory Name: Physical Geography

Rule: Must complete at least 1 of the following courses

Criterion: C- Number of Credits 3

Course Listing

ERTH 303N Weather and Climate 3

GPHY 311N Biogeography 3

GPHY 314 Global Mountain Environments3

GPHY 317 Geomorphology 3

GPHY 438 Mountain Field Study 3

GPHY 525 Adv Physical Geography 3

Subcategory Name: Geography and Society Rule: Must complete at least 1 of the following:

Criterion: C- Number of Credits 3

Course Listing

GPHY 323S Econ. Geog. of Rural Areas 3

GPHY 421 Sustainable Cities 3

GPHY 434 Food and Famine 3

GPHY 443 Cultural & Global Competence 3

GPHY 515 Adv Human Geography 3

Subcategory Name: Human Environment Interaction

Course Listing

GPHY 335 Water Policy 3

GPHY 336 Exploration & Discovery 3

GPHY 338 Mountains and Society 3

GPHY 432 Human Role Environ Change 3

GPHY 433 Cultural Ecology 3

Commentary: Major Electives

Category Name: Degree Electives

Rule: 36 Geography credits are required for the major. May require additional Geography elective credits to fulfill the major. Criterion: Number of Credits

Course Listing Commentary:

Commentary: Capstone

Category Name: Capstone

Rule: Seniors must complete the following course

Criterion: C- Number of Credits 1

Course Listing

GPHY 400 Geography Capstone 1

Commentary: Seniors must enroll in GPHY 400 in fall, attend GPHY 500 in fall, and complete course requirements in spring.

Commentary:

Upper Division Writing

Category Name: Upper Division Writing

Rule: Must complete 1 of the following courses

Criterion: C- Number of Credits 3

Course Listing

GPHY 335 Water Policy 3

GPHY 499 senior thesis / capstone 3

Commentary: GPHY 335 will also count toward the upper division core requirements GPHY 499 will also count toward upper division elective credits.

Other science-based writing courses(e.g. GEO 320, GEO 499, BIOO 470, BIOO 475) may be approved by the advisor.

Commentary:

Option Requirements

Category Name: Science Electives

Rule: Must complete 1 of the following science categories

Criterion: Number of Credits 6-10

Course Listing

Commentary: Science sequence must be approved by advisor as appropriate to individual student's goals. Different science sequences may be approved by the advisor.

Subcategory Name: Biology

Rule: May complete the following courses

Criterion: C- Number of Credits 6

Course Listing

BIOE 172N Introductory Ecology 3

BIOO 105N Introduction to Botany 3

Commentary:

Subcategory Name: Chemistry

Rule: May complete the following courses

Criterion: C- Number of Credits 6

Course Listing

CHMY 121N Intro to General Chemistry 3

CHMY 123N Intro to Organic & Biochem 3

Commentary:

Subcategory Name: College Chemistry Rule: May complete the following courses

Criterion: C- Number of Credits 10

Course Listing

CHMY 141N College Chemistry I 5

CHMY 143N College Chemistry II 5

Commentary:

Subcategory Name: College Physics Rule: May complete the following courses

Criterion: C- Number of Credits 10

Course Listing

PHSX 205N College Physics I 4  
PHSX 206N College Physics I Laboratory 1  
PHSX 207N College Physics II 4

Subcategory Name: Physics with Calculus Rule: May complete the following courses

Criterion: C- Number of Credits 10

Course Listing

PHSX 215N Fund of Physics w/Calc I 4  
PHSX 216N Physics Laboratory I w/Calc 1  
PHSX 217N Fund of Physics w/Calc II 4  
PHSX 218N Physics Laboratory II w/Calc 1

Degree Specific Mathematics

Category Name: General Ed Symbolic Systems (Mathematics) Rule: Must complete 1 of the following subcategories

Criterion: Number of Credits 3-7

Course Listing

Commentary: Students MUST meet the symbolic systems requirement by taking M 115 and STAT 216, OR just one of M 162, M 171, or STAT 451. M 171 Calculus is recommended.

Subcategory Name: Math Fundamentals

Rule: May complete all of the following courses

Criterion: C- Number of Credits 7

Course Listing

M 115 Probability and Linear Math 3  
STAT 216 Introduction to Statistics 4

Commentary:

Subcategory Name: Advanced Math

Rule: May complete 1 of the following courses

Criterion: C- Number of Credits 3-4

Course Listing

M 162 Applied Calculus 4  
M 171 Calculus I 4  
STAT 451 Statistical Methods I 3

Commentary: M 171 Calculus I is recommended.

Commentary: GenEd credits do not count towards degree credits.

Depending on the courses selected, the degree requirements vary from 36 to 39 credits.

## **College Humanities & Sciences Catalog Year: 2015-2016**

Degree Type: Bachelor of Science Level: Major Subject: **Geography** Option: **Physical Geography**

Total Credits: 47 Cumulative GPA Required: 2.5

In addition to satisfying the general requirements for a B.S. degree in geography, a student pursuing the option in physical geography must complete additional requirements, including EARTH 303N (GEOG 322N), GPHY 317 (GEOG 324), and GPHY 411N (GEOG 426N), though substitutions which broaden the student's curriculum may be approved by their advisor. Also, students must complete an additional appropriate math course above the 150 level to complement the one used to fulfill their symbolic systems requirements (the second semester of Calculus is recommended), and the two-course sequence in science used to fulfill the B.S. requirement MUST be one of the

following: CHMY121N-123N (CHEM 151N-152N), CHMY 141N-143N (CHEM 161N-162N), PHSX 205N-207N (PHYS 121N-122N), PHSX 215N-217N (PHYS 211N- 212N), or BIOO 105N (BIOL 120N), BIOE 172N (BIOL 121N)).

Lower Division Core

Category Name: Introduction to Geography Rule: Must complete all of the following courses:

Criterion: C- Number of Credits 7

Course Listing

GPHY 111N Intro to Physical Geography 3

GPHY 112N Intro to Phys Geography Lab 1

GPHY 121S Human Geography 3

Commentary: Lower Division Core

Category Name: Regional Geography Course

Rule: Must complete at least 1 of the following courses

Criterion: C- Number of Credits 3

Course Listing

GPHY 141S Geography of World Regions 3

GPHY 144 Montana's Mountains 3

GPHY 241 Montana 3

GPHY 243X Africa 3

GPHY 245X The Middle East 3

GPHY 342 North America 3

GPHY 344 Crown of the Continent3

GPHY 347 Regional Geography (Mult Reg) 3

GPHY 348 Field Studies in Geography 3

GPHY 442 Regionalism & Rocky Mtn West 3

GPHY 444 High Asia 3

GPHY 445 Regional Geography 3

Commentary: Lower Division Core

Category Name: Geographic Methods

Rule: Must complete all of the following courses

Criterion: C- Number of Credits 6

Course Listing

Commentary: Upper Division Core

Category Name: Upper Division Systematic Geography Rule: Must complete the following subcategories of courses

Criterion: C- Number of Credits 9

Course Listing Commentary:

Subcategory Name: Physical Geography

Rule: Must complete at least 1 of the following courses

Criterion: C- Number of Credits 3

Course Listing

ERTH 303N Weather and Climate 3

GPHY 311N Biogeography 3

GPHY 314 Global Mountain Environments3

GPHY 317    Geomorphology        3  
GPHY 438    Mountain Field Study    3  
GPHY 525    Adv Physical Geography        3

Commentary: These courses simultaneously count towards the Upper Division Systematic Geography-Physical Geography and the Physical Geography Option core (see below).

Subcategory Name: Geography and Society Rule: Must complete at least 1 of the following:

Criterion: C-    Number of Credits 3

Course Listing

GPHY 323S   Econ. Geog. of Rural Areas    3  
GPHY 421    Sustainable Cities        3  
GPHY 434    Food and Famine        3  
GPHY 443    Cultural & Global Competence 3  
GPHY 515    Adv Human Geography        3

Subcategory Name: Human Environment Interaction Rule: Must complete at least 1 of the following:

Criterion: C-    Number of Credits 3

Course Listing

GPHY 338    Mountains and Society 3  
GPHY 432    Human Role Environ Change 3  
GPHY 433    Cultural Ecology        3

Commentary: Capstone

Category Name: Capstone

Rule: Seniors must complete the following course

Criterion: C-    Number of Credits 1

Course Listing

GPHY 400    Geography Capstone    1

Commentary: Seniors must enroll in GPHY 400 in fall, attend GPHY 500 in fall, and complete course requirements in spring.

Upper Division Writing

Category Name: Upper Division Writing

Rule: Must complete 1 of the following courses

Criterion: C-    Number of Credits 3

Course Listing

GPHY 335    Water Policy    3  
GPHY 499    senior thesis / capstone        3

Commentary: GPHY 335 will also count toward the upper division core requirements GPHY 499 will also count toward upper division elective credits.

Other science-based writing courses (e.g. GEO 320, GEO 499, BIOO 470, BIOO 475) may be approved by the advisor.

Commentary: Option Requirements

Category Name: Physical Geography Option Science Electives Rule: Must complete 1 of the following science categories

Criterion:        Number of Credits 6-10

Course Listing Commentary:

Subcategory Name: Biology

Rule: May complete the following courses

BIOE 172N Introductory Ecology 3

BIOO 105N Introduction to Botany 3

Subcategory Name: Chemistry

Rule: May complete the following courses

Criterion: C- Number of Credits 6

Course Listing

CHMY 121N Intro to General Chemistry 3

CHMY 123N Intro to Organic & Biochem 3

Subcategory Name: College Chemistry Rule: May complete the following courses

Criterion: C- Number of Credits 10

Course Listing

CHMY 141N College Chemistry I 5

CHMY 143N College Chemistry II 5

Subcategory Name: College Physics Rule: May complete the following courses

Criterion: C- Number of Credits 10

Course Listing

PHSX 205N College Physics I 4

PHSX 206N College Physics I Laboratory 1

PHSX 207N College Physics II 4

PHSX 208N College Physics II Laboratory 1

Subcategory Name: Physics with Calculus Rule: May complete the following courses

Criterion: C- Number of Credits 10

Course Listing

PHSX 215N Fund of Physics w/Calc I 4

PHSX 216N Physics Laboratory I w/Calc 1

PHSX 217N Fund of Physics w/Calc II 4

PHSX 218N Physics Laboratory II w/Calc 1

Option Requirements

Category Name: Physical Geography Option Core Rule: Must complete all of the following courses

Criterion: C- Number of Credits 6-9

Course Listing

ERTH 303N Weather and Climate 3

GPHY 311N Biogeography 3

GPHY 317 Geomorphology 3

Commentary: One course can be used to satisfy the Upper Division Systematic Geography – Physical Geography. Substitutions which broaden the student's curriculum may be approved by their advisor.

Commentary: Option Requirements

Category Name: Advanced Math

Rule: Must complete 1 additional math or statistics course in addition to the one chosen for Math Fundamentals. For instance, if M 171 has been taken, M 172 is recommended.

Criterion: C- Number of Credits 3-4

Course Listing Commentary:

Degree Specific Mathematics

Category Name: General Ed Symbolic Systems (Math Fundamentals) Rule: Must complete 1 of the following courses

Criterion: C- Number of Credits 3-4

Course Listing

M 162 Applied Calculus 4

M 171 Calculus I 4

M 172 Calculus II 4

STAT 451 Statistical Methods I 3

Commentary: Gen Ed credits do not count towards degree credits.

## **College Humanities & Sciences Catalog Year: 2015-2016**

Degree Type: Certificate of Art Level: **Certificate** Subject: **Geographic Information Systems**

Total Credits: 20 Cumulative GPA Required: 3.0

### *Certificate in GIS Sciences and Technologies*

The Certificate in GIS Sciences and Technologies, jointly offered by the departments of Geography and Forest Management, is aimed at present or future professionals or scientists who require skills in GIS technologies. The purpose of this program is to provide undergraduate students or individuals possessing an undergraduate degree with the training, knowledge, and understanding necessary to acquire, process, analyze, and properly display digital geographic data.

### **Special Requirements for the Certificate**

To earn a certificate in GIS Sciences and Technologies, students must either complete or have completed an undergraduate degree and complete a minimum of 20 semester credit hours of course work, including 9 to 11 required credits and 9 to 11 elective credits as described below. Students must achieve at least an overall grade point average of 3.0 for courses within the program in order to earn a certificate. The certificate will be awarded upon the successful completion of all of the requirements of the certificate and the undergraduate degree.

#### Lower Division Core

Category Name: Required GIS Core Courses

Rule: Must complete 1 from each of the following subcategories

Criterion: C- Number of Credits 9-11

Course Listing Commentary:

Subcategory Name: Introduction to GIS

Rule: Must complete 1 and only 1 of the following courses

Criterion: C- Number of Credits 3

Course Listing

FORS 250 Intro to GIS for Forest Mgt 3

GPHY 284 Intro to GIS and Cartography 3

Commentary: Prior to Fall 2013, this was fulfilled by FOR 250 & 350 or GPHY 381 & 382. In 2013 this requirement could be fulfilled with FORS 284.

Subcategory Name: Photogrammetry/Remote Sensing Rule: Must complete 3-4 credits of the following courses

Criterion: C- Number of Credits 3-4

Course Listing

FORS 351 Env Remote Sensing 3

GPHY 487 Remote Sensing/Raster GIS 3

GPHY 489 Cartography/GIS Laboratory 1

Commentary: GPHY 487 and 489 should be completed together.

Subcategory Name: Additional Required Courses

Rule: Must complete 3-4 credits of the following courses

Criterion: C- Number of Credits 3-4

Course Listing

FORS 350 Forestry Apps of GIS 3

GPHY 488 Thematic Cartography & GIS 3

GPHY 489 Cartography/GIS Laboratory 1

Commentary: GPHY 488 and 489 should be completed together. Spring 2014 and 2015, GPHY 488 and 489 are fulfilled by GPHY 491 GIS Applications.

Commentary: Upper Division Core

Category Name: Advanced Elective Courses

Rule: Must complete 9-11 credits of the following subcategories

Criterion: C- Number of Credits 9-11

Course Listing

Subcategory Name: Raster GIS, Remote Sensing, and Image Analysis Rule: May complete 4-8 credits from the following courses

Criterion: C- Number of Credits 4-8

Course Listing

FORS 551 Digital Image Processing 4

GPHY 587 Image Analysis & Modeling 3

GPHY 589 Cartography/GIS Laboratory 1

Commentary: GPHY 587 and 489 should be completed together.

Subcategory Name: Vector GIS and Networks

Rule: May complete 3-11 credits of the following courses

Criterion: C- Number of Credits 3-11

Course Listing

GPHY 486 Transport, Planning & GIS 3

GPHY 489 Cartography/GIS Laboratory 1

GPHY 580 Seminar GIS & Cartography 3

GPHY 588 Vector GIS 3

GPHY 589 Cartography/GIS Laboratory 1

Commentary: GPHY 486 and 489 should be completed together. GPHY 588 and 589 should be completed together.

Subcategory Name: Data Management and Programming Rule: May complete 3-10 credits of the following courses

Criterion: C- Number of Credits 3-10



#### Course Listing

CSCI 250	Computer Mding/Science Majors	3
FORS 505	Sampling Methods	3
GPHY 468	Community & Regional Analysis	3
GPHY 469	Planning & Analysis Laboratory	1

Commentary: GPHY 468 and 469 should be completed together.

Subcategory Name: GIS Applications

Rule: May complete 3-11 credits of the following courses

Criterion: C- Number of Credits 3-11

#### Course Listing

ANTY 452	GIS in Archaeology	3
FORS 503	GIS:Meth & Applic I	3
GPHY 385	Field Techniques	3
GPHY 481	Advanced Cartographic Design	3
GPHY 482	Spatial Analysis & GIS	3
GPHY 564	Planning Design	3
WILD 562	Wildlife Habitat Modeling	3

Commentary: GPHY 482 and 489 should be completed together.

## **College Humanities & Sciences      Catalog Year: 2015-2016**

Degree Type: Minor    Level: **Minor**    Subject: **Geography (Minor)**

Total Credits: 19      Cumulative GPA Required: 2.0

#### Lower Division Core

Category Name: Introduction to Geography Rule: Must complete all of the following courses

Criterion: C-    Number of Credits 7

#### Course Listing

GPHY 111N	Intro to Physical Geography	3
GPHY 112N	Intro to Phys Geography Lab	1
GPHY 121S	Human Geography	3

Commentary: Lower Division Core

Category Name: Regional Core

Rule: Must complete at least 1 of the following courses

Criterion: C-    Number of Credits 3

#### Course Listing

GPHY 141S	Geography of World Regions	3
GPHY 241	Montana	3
GPHY 243X	Africa	3
GPHY 245X	The Middle East	3
GPHY 342	North America	3
GPHY 344	Crown of the Continent	3
GPHY 347	Regional Geography (Mult Reg)	3
GPHY 348	Field Studies in Geography	3
GPHY 442	Regionalism & Rocky Mtn West	3

GPHY 444 High Asia 3

GPHY 445 Regional Geography 3

Commentary: Upper Division Core

Category Name: Geographic Methods

Rule: Must complete 1 of the following courses

Criterion: C- Number of Credits 3

Course Listing

GPHY 284 Intro to GIS and Cartography 3

GPHY 385 Field Techniques 3

Commentary: Major Electives

Category Name: Upper Division Systematic Geography

Rule: Must complete at least 1 course from 2 subcategories: 'Physical Geography', 'Geography and Society', and 'Human-Environment Interaction' Criterion: Number of Credits 6

Course Listing Commentary:

Subcategory Name: Physical Geography Rule: May complete 1 of the following courses

Criterion: C- Number of Credits 3

Course Listing

ERTH 303N Weather and Climate 3

GPHY 311N Biogeography 3

GPHY 314 Global Mountain Environments 3

GPHY 438 Mountain Field Study 3

GPHY 525 Adv Physical Geography 3

Subcategory Name: Geography and Society Rule: May complete 1 of the following courses

Criterion: C- Number of Credits 3

Course Listing

GPHY 323S Econ. Geog. of Rural Areas 3

GPHY 421 Sustainable Cities 3

GPHY 434 Food and Famine 3

GPHY 443 Cultural & Global Competence 3

GPHY 515 Adv Human Geography 3

Subcategory Name: Human Environment Interaction Rule: May complete 1 of the following courses

Criterion: C- Number of Credits 3

Course Listing

GPHY 335 Water Policy 3

GPHY 336 Exploration & Discovery 3

GPHY 338 Mountains and Society 3

GPHY 432 Human Role Environ Change 3

GPHY 433 Cultural Ecology 3

## College Humanities & Sciences Catalog Year: 2015-2016

Degree Type: Minor Level: **Minor** Subject: **Mountain Studies (Minor)**

Total Credits: 18 Cumulative GPA Required: 2.5

Mountain Studies is an interdisciplinary field of study focusing on the physical and human dimensions of mountain environments. Coursework in the minor emphasizes physical geography and mountain-society interactions, including a critical analysis of the processes of change and influence shaping local and regional mountain environments today. The minor in Mountain Studies takes advantage of existing faculty expertise and an array of courses to provide students with a science-based curriculum and global perspective. Students pursuing the minor in mountain studies will develop knowledge and skills appropriate for graduate study and for working with government and non-government agencies and groups.

Upper Division Core

Category Name: Upper Division Core

Rule: Must complete all of the following courses

Criterion: C- Number of Credits 6

Course Listing

GPHY 314 Global Mountain Environments 3

GPHY 338 Mountains and Society 3

Commentary: Major Electives

Category Name: Region-Specific Mountain Studies Rule: Must complete 6 credits from the following courses

Criterion: C- Number of Credits 6

Course Listing

BIOL 342 Field Ecology 5

BIOL 459 Alpine Ecology 3

BIOO 101N Survey MT Wildlife & Habitats 3

BIOO 335 Rocky Mountain Flora 3

GPHY 144 Montana's Mountains 3

GPHY 344 Crown of the Continent 3

GPHY 391 Special Topics 1 To 12

GPHY 438 Mountain Field Study 3

GPHY 442 Regionalism & Rocky Mtn West 3

GPHY 444 High Asia 3

NRSM 352 Himalayan Environment and Dev 3

NRSM 391 Special Topics 0 To 12

PTRM 353 Tourism & Sustainability Himalaya 3

PTRM 418 Winter Wilderness Field Studies 3

Commentary: Two sections of NRSM 391 may be taken to fulfill this requirements, each for 3 credits:

- 1) Community and Conservation in the Northern Rockies
- 2) Ecological Restoration in Greater Yellowstone

Commentary: Major Electives

Category Name: General Mountain Studies

Rule: Must complete 6 credits from the following courses

Criterion: C- Number of Credits 6

Course Listing

BIOL 451 Landscape Ecology 3

ERTH 303N Weather and Climate 3

FORS 330 Forest Ecology 3

GEO 391	Special Topics 1 To 9	
GEO 433	Global Tectonics	3
GEO 488	Snow, Ice and Climate	3
GPHY 311N	Biogeography	3
NASX 351	Traditional Eco Knowledge	3
NRSM 311	Field Stds ecol/Human Commun	2 To 3
NRSM 385	Watershed Hydrology	3
PTRM 482	Wilderness & Protctd Area Mgt	3

Commentary: One section of NRSM 311 fulfills this requirement: Conservation Biology in the Northern Rockies  
Degree Commentary: a minimum of 18 additional credits in this minor.

## Department Faculty

### Professor

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- Sarah J. Halvorson, Professor
- Ulrich Kamp, Professor
- David Shively, Professor
- Christiane von Reichert, Professor and Chair

### Associate Professor

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- Anna Klene, Associate Professor

### Assistant Professor

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- Diep Dao, Assistant Professor
- Thomas Sullivan, Visiting Assistant Professor

### Adjunct

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- Kyle Balke
- Laura Becerra
- Rory Cowie, Visiting Faculty
- Leah Samberg

### Lecturer

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- Rick Graetz, Lecturer
- Kevin McManigal, Lecturer & GIST Certificate Coordinator

### Affiliates

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- Donald Alford, Hydrology Consultant
- Heather Almquist
- Claudia J. Carr, Associate Professor of Environmental Science
- Faith Ann Heinsch

- Zachary A. Holden, Ecologist
- Ia Iashvili
- Irena Mrak, Assistant Research Professor
- Tamara Wall

## Emeritus

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- John Donahue, Emeritus Professor
- Jeffrey Gritzner, Emeritus Professor
- Darshan S. Kang, Emeritus Professor
- Paul Wilson, Emeritus Professor

## Course Descriptions

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### Earth Systems

#### ERTH 303N - Weather and Climate

Credits: 3. Offered spring. Same as CCS 303N. Origin, composition, structure, and dynamics of the atmosphere, gas and radiation laws, energy budget and balance, weather elements, North American weather systems, and climate change. To succeed in this course students should have comfort with basic algebra. Course Attributes: Natural Science Course

### Geography

#### GPHY 111N - Intro to Physical Geography

Credits: 3. Offered autumn and spring. Introduction to the earth's major natural environmental systems, their spatial distribution and interrelationships, including weather and climate, vegetation and ecosystems, soils, landforms, and earth-surface processes. Course Attributes: Natural Science Course

#### GPHY 112N - Intro to Phys Geography Lab

Credits: 1. Offered autumn and spring. Prereq. or coreq., GPHY 111. Introduction to concepts and techniques needed to understand and analyze the information contained in various types of maps, graphs, aerial photos, imagery, and other graphics and geographic data sets. This is prerequisite to GPHY 385. Course Attributes: Natural Science Lab Course

#### GPHY 121S - Human Geography

Credits: 3. Offered autumn and spring. Introduction to Human Geography focuses upon the linkages between geography and society including analysis of regions, ethnic groups, urban landscapes, migration and population change, geopolitics, economics, and cultural differences. Course Attributes: Social Sciences Course

#### GPHY 141S - Geography of World Regions

Credits: 3. Offered autumn. An overall view of how the lands and peoples of the world are organized into coherent geographical regions, how landscapes differ from region to region, and how the people differ in terms of their traits, beliefs, ways of life, and economic livelihood. Course Attributes: Social Sciences Course Indigenous and Global

#### GPHY 144 - Montana's Mountains

Credits: 3. Consent of Instructor. A field-based course offered during winter session in the winter splendor of the North Fork of the Flathead River and Glacier National Park. Topics addressed include physical geography, geology, winter ecology, national park management, environmental history, and the changing economy of the region.

#### GPHY 191X - Special Topics

Credits: 1 TO 3. (R 6) Offered intermittently. Experimental offerings of visiting professors, experimental offerings of new courses, or one time offerings of current topics. Course Attributes: Internships/Practicums Indigenous and Global

#### GPHY 241 - Montana

Credits: 3. Offered autumn. The physical, cultural, economic, political, and historical geography of the state including Montana's mountains and the prairies.

#### GPHY 243 - Africa

Credits: 3. Offered intermittently. A survey of the biophysical and cultural geography of Sub-Saharan Africa. Emphasis is on the region's cultural-historical development and current ecological, demographic, and economic patterns.

#### GPHY 245X - The Middle East

Credits: 3. Offered intermittently. A survey of the biophysical and cultural geography of Southwest Asia and North Africa. Emphasis on environmental change; rehistory; patterns of cultural and historical change; issues of socio-economic, religious, and political diversity; and the broader political significance of the region. Course Attributes: Indigenous and Global

#### GPHY 284 - Intro to GIS and Cartography

Credits: 3. Offered every term. Open to sophomores or juniors or with Consent of Instructor. This course is designed as a practical introduction to the use of Geographic Information Systems (GIS) for storing, retrieving, analyzing and displaying spatial data. It will also cover the history of cartography and the conventions of the modern map-making process. Students need to register for a required lab section.

#### GPHY 291 - Special Topics

Credits: 1 TO 6. (R-6) Offered intermittently. Experimental offerings of visiting professors, experimental offerings of new courses, or one-time offerings of current topics.

#### GPHY 295 - Mountain Field Studies

Credits: 1. Offered autumn and spring as a series of one-credit courses, maximum of three-credits per semester. Field studies of Montana's Rocky Mountain Front, Crown of the Continent, or Yellowstone. Students prepare to conduct field work, spend time in the field observing wildlife, physical landscapes and cultural aspects of these landscapes, and follow up their observations in written reports.

#### GPHY 311N - Biogeography

Credits: 3. Offered intermittently. Changing patterns of plant and animal distributions in space and time. Combination of historical and ecological approaches to biological species and communities. Study of external causes of plant and animal distributions, especially climatic change and human impacts. Course Attributes: Natural Science Course

#### GPHY 314 - Global Mountain Environments

Credits: 3. Offered most autumns. The study of mountain environments and their physical processes around the globe: Andes, Appalachians, East African Mountains, European Alps, Hindu Kush-Himalaya-Karakoram, Pamir, Rocky Mountains, Southern Alps of New Zealand, Tien Shan, and others. Topics include mountain building, alpine glaciers, mountain geomorphology and climatology, mountain watersheds, mountain biogeography, and mountain hazards such as earthquakes and mass movements.

#### GPHY 317 - Geomorphology

Credits: 3. Offered intermittently. Prereq., GPHY 111N or GEO 101N. Important landforms and landscapes, their biophysical processes, and their formative elements.

#### GPHY 323S - Econ. Geog. of Rural Areas

Credits: 3. Offered spring odd-numbered years. Study of the location of economic activities, including agriculture, industry, and services. Focus on the changing nature of rural areas. Course Attributes: Social Sciences Course  
GPHY 335 - Water Policy

Credits: 3. Offered autumn. Prereq., WRIT 101 or WRIT 201, and one Approved Writing Course. Exploration of water resources issues facing the public, resource managers, and water users in the western United States today. Examines concepts, terms, and regulatory environment which provide the foundation for modern water management and policy. Course Attributes: Writing Course-Advanced

GPHY 336 - Exploration & Discovery

Credits: 3. Offered intermittently. Emphasis on the evidence of language, genetics, material culture, and transoceanic plant and animal exchanges in assessing mobility and population distributions in prehistory; factors that motivate exploration; the history of navigation; the impacts of exploration upon science, society, economics, and government.

GPHY 338 - Mountains and Society

Credits: 3. Offered spring. Physical and cultural aspects of the mountains of North and South America, Europe, Africa, and Asia. Emphasis on combining the physical landscape with an overview of the indigenous people who inhabit the worlds' heights.

GPHY 342 - North America

Credits: 3. Offered intermittently. Physiographic regions of North America; highlights of historical geography blended with physical and cultural aspects of the continent. Lesser known places are explored.

GPHY 344 - Crown of the Continent

Credits: 3. Offered autumn. The study of the geographical setting of the Crown of the Continent of North America, including the richness of physical geography, history, culture, and models of conservation. Examines ongoing research initiatives, impacts of climate change, regional transformations, and the relationship between people and this mountainous environment.

GPHY 347 - Regional Geography (Multiple Regions)

Credits: 3. (R-9) Offered intermittently. Selected regions will be listed as appropriate in each Class Schedule.

GPHY 348 - Field Studies in Geography

Credits: 3. (R-12) Offered autumn and spring. Through extended backcountry travel, experiential examination of regional landforms, climate, hydrology, soils, and patterns of vegetation and wildlife. Local landscapes, natural-resource endowment, and societies with particular emphasis on human-environmental interaction. Geographical skills and techniques, including map reading and navigational skills. Offered by the Wild Rockies Field Institute as part of a semester-long, 12-credit field experience with corequisite courses in allied fields.

GPHY 378 - Preceptorship in Geography

Credits: 1 TO 3. (R-6) Offered autumn and spring. Consent of instructor. Assisting a faculty member by tutoring, conducting review sessions, helping students with research projects, and carrying out other class-related responsibilities. Open to juniors and seniors who apply to instructor for consent.

GPHY 385 - Field Techniques

Credits: 3. Offered autumn and intermittently in spring. Prereq., GPHY 112N or Consent of Instructor. Field techniques used by geographers and planners in making field observations and in collecting data.

GPHY 391 - Special Topics

Credits: 1 TO 12. (R-12) Offered intermittently. Experimental offerings of visiting professors, experimental offerings of new courses, or one-time offerings of current topics.

GPHY 392 - Independent Study

Credits: 1 TO 9. (R-9) Offered every term. Consent of Instructor. Independent study in any subfield of geography.

#### GPHY 395 - Field Studies

Credits: 1 TO 9. (R-9) Offered fall and/or spring. Field experience in the region. Includes geographically relevant field courses offered as part of Northwest Connections' Landscapes and Livelihood Field Semester, focusing on natural and human communities and on conservation solutions of the Southwest Crown of the Continent Region: Sustainability and Agriculture (3 cr), and Biogeography of Northwest Montana (4 cr).

#### GPHY 400 - Geography Capstone

Credits: 1. Offered autumn. Prereq., Senior standing. Exploration of current research, projects, and programs of geographers and scientists/practitioners in allied disciplines and fields, and preparation of a professional portfolio. Student preparation for post-graduate professional and academic careers is emphasized.

#### GPHY 421 - Sustainable Cities

Credits: 3. Offered spring even-numbered years. Prereq., upper-division or graduate standing. Same as CCS 421. A discussion of sustainability efforts in cities around the world. Topics include, for example, urban sprawl and smart growth, alternative energy, public transportation, integrated waste management, integrated water management, green architecture, and urban agriculture.

#### GPHY 432 - Human Role Environ Change

Credits: 3. Offered intermittently. A systematic examination of the ways in which the major physical systems and ecosystems of the earth have been modified by human activity, and approaches to the rehabilitation of these systems.

#### GPHY 433 - Cultural Ecology

Credits: 3. Offered most spring. Prereq., WRIT 101 or WRIT 201 and one Approved Writing Course or consent of instructor. Examines issues related to culture and the natural environment. Topics include cultural origins and diversity, geography of religion, geolinguistics, plant and animal domestication, livelihood systems, folk and popular culture, ethnic geography, political patterns, demography, industries, urban genesis, and the transformation of environmental systems. Course Attributes: Writing Course-Advanced

#### GPHY 434 - Food and Famine

Credits: 3. Offered intermittently. Exploration of the production, distribution, and consumption of food; the causes and consequences of hunger; and measures that might be taken to relieve hunger.

#### GPHY 438 - Mountain Field Study

Credits: 3. (R-6) Upper-division or graduate standing and consent of instructor. Examination of aspects of the study of mountain geography through a two-week field course based in a mountainous country and/or region. Possible areas of focus include, but are not limited to, the Northern Rocky Mountains, the Alps, the Himalaya, and the Andes.

#### GPHY 442 - Regionalism & Rocky Mtn West

Credits: 3. Offered intermittently. Investigation of regionalism as a concept and its future in the Rocky Mountain West. Regionalism as a geographical, economic, political, and cultural entity. Course Attributes: Writing Course-Upper-Division

#### GPHY 465 - Planning Principles & Processes

Credits: 3. Offered autumn even-numbered years. Prereq., upper-division or graduate standing. Surveys planning principles, practices and issues in urban and rural environments. Attention is devoted to Montana, state planning programs in the United States., and federal programs and policies that influence land-use planning. Emphasizes skills and techniques used in plan development and implementation.

#### GPHY 466 - Environmental Planning



Credits: 3. Offered autumn odd-numbered years. Introduction to practice of environmental planning which includes elements of physical planning, planning design at the landscape scale, and conservation planning. Includes field visits and project-based work.

#### GPHY 468 - Community & Regional Analysis

Credits: 3. Offered autumn. Prereq., M 115 or M 121 or Consent of Instructor. Coreq., GPHY 469. Socio-demographic analysis of communities and regions: population, employment, and spatial interaction. Hands-on course designed for future planners, GIS analysts, and others interested in socio-demographic change.

#### GPHY 469 - Planning & Analysis Laboratory

Credits: 1. Offered autumn. Coreq., GPHY 468. Laboratory to accompany GPHY 468.

#### GPHY 481 - Advanced Cartographic Design

Credits: 3. Offered autumn. Prereq GPHY 284 or GPHY 381 or FORS 250 or Consent of Instructor. The course concentrates on the presentation of spatial data and the construction of cartographic products that have clear communication and excellent aesthetic design. The class meets the University's service learning course objectives through a semester long project where students consult with a client, design and construct a map, and deliver a final product.

#### GPHY 482 - Spatial Analysis & GIS

Credits: 3. Offered intermittently. Prereq., GPHY 284 and STAT 216, or Consent of Instructor. Quantitative analysis of spatial data, including techniques for pattern analysis, classification, and interpolation within a GIS environment.

#### GPHY 485 - Internet GIS

Credits: 3. Offered intermittently. Prereq., GPHY 284 or GPHY 381; coreq., GPHY 489. Principles and techniques for distributing GIS and mapping applications through the Internet.

#### GPHY 486 - Transport, Planning & GIS

Credits: 3. Offered intermittently during wintersession (2 credits) or spring semester (3 credits.) Prereq., M 115 or M 121 or consent of instr. Coreq., GPHY 489. A project-oriented course focusing on patterns and trends in urban passenger transportation, principles of transport planning, and modeling in GIS-T.

#### GPHY 487 - Remote Sensing/Raster GIS

Credits: 3. Offered autumn. Prereq. or coreq., GPHY 284 or GPHY 381 or Consent of Instructor. Coreq., GPHY 489. Basic principles of remote sensing and analyzing images within a raster GIS. Review current data sources.

#### GPHY 488 - Applications of GIS

Credits: 0 TO 3. Offered spring. Prereq., GPHY 284 or GPHY 381 or FORS 250 or Consent of Instructor; Application of GIS for managing natural and cultural resources. Covers choropleth maps, dot maps, proportional figure maps, isarithmic maps, and others. Includes computer mapping and GIS exercises. Students need to register for a required lab section.

#### GPHY 489 - Cartography/GIS Laboratory

Credits: 1. (R-4) Offered autumn and spring. Coreq., GPHY 485, 486, or 487. Lab to accompany cartography and GIS courses.

#### GPHY 491 - Special Topics

Credits: 0 TO 9. (R-9) Offered intermittently. Experimental offerings of visiting professors, experimental offerings of new courses, or one-time offerings of current topics.

#### GPHY 492 - Independent Study

Credits: 1 TO 9. (R-9) Offered every term. Consent of instructor. Independent study in any subfield of geography.

#### GPHY 497 - Workshop in Teaching Geography