GPHY 121D. Human Geography. 3 Credits. (3 Lec) F
Global geographies of population and economic development; patterns of language and religion; global distributions of agriculture, industry, and urban landscapes; use of human geography to analyze selected world problems.

GPHY 141D. Geography of World Regions. 3 Credits. (3 Lec) S
Resume of major world regions; their cultures, populations, resources, utilization of land; emphasis on regions outside Anglo-America.

GPHY 262. Spatial Sci Tech & Application. 3 Credits. (2 Lec, 1 Lab) S
Fundamentals of GPS, GIS and remote sensing, and their application in a wide range of disciplines. Exploration of the increasing use of geospatial technologies in our world and their impact on our lives. Students will gain hands-on experience with GPS receivers, and GPS, GIS and remote sensing software.

GPHY 284. Intro to GIS Science & Cartog. 3 Credits. (2 Lec, 1 Lab) F, Su
Offered through the Earth Sciences and Land Resources and Environmental Sciences (LRES) Departments. Concepts of spatial thinking; understanding spatial relationships and interaction in the natural and built environment. Spatial data principles, data models, relational database concepts, contemporary digital cartography, design and composition, spatial data conversion, introduction to spatial analysis and synthesis. Concepts of spatial thinking and application; identifying geospatial concepts and methods related to real world issues. Fundamentals of cartography and spatial data principles; students will apply concepts of scale, coordinate systems, projections and create thematic maps according to cartographic standards.

GPHY 290R. Undergraduate Research. 1-6 Credits. (1-6 Ind; max unlimited) F, Su
May be repeated. PREREQUISITE: Consent of instructor. Directed undergraduate research/creative activity which may culminate in a written work or other creative project. Course will address responsible conduct of research.

GPHY 291. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand
Max 12 cr. PREREQUISITE: None required but some may be determined necessary by each offering department. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

GPHY 321. Urban Geography. 3 Credits. (3 Lec) S alternate years, to be offered odd years.
PREREQUISITE: GPHY 121D or STAT 216Q. Historical evolution and spatial patterns of urban places in the U.S. and the world; human-environment relationship in urban areas; analyses of urban economy and land use in the city; spatial structure of urban system in national and regional background; some important methods and theories in urban geographical research.

GPHY 322. Economic Geography. 3 Credits. (3 Lec) S
PREREQUISITE: GPHY 121D and STAT 216Q. Topical issues and contemporary debates in economic geography with a focus on contemporary economic life and networks and their functions at the global, national, and local scales. Topics include: uneven development, climate change, transnational corporations, migrant labor and ethnic economies as well as the spatial patterns and location of economic activity.

GPHY 325. Cultural Geography. 3 Credits. (3 Lec) S alternate years, to be offered odd years.
PREREQUISITE: GPHY 121D American cultural landscape evolution; origins and diffusions of American culture traits; evolution of American culture regions.

GPHY 326. Geography of Energy Resources. 3 Credits. (3 Lec) S
PREREQUISITES: GPHY 121 OR GPHY 141 pre-industrial and contemporary energy systems; global distribution of energy resources; implications of energy resource distribution for contemporary geopolitics and development; metrics of energy consumption.

GPHY 329. Environment and Society. 3 Credits. (3 Lec) F
This course introduces students to the study of relationships between people and the environment from a social science perspective. It explores the social causes and consequences of environmental change and examines the different approaches to decision-making about environmental issues.

GPHY 357. GPS Fund/App in Mapping. 3 Credits. (1 Lec, 2 Lab) S
PREREQUISITE: GPHY 284. Theory and application of the Global Navigation Satellite Systems (GNSS) to mapping in natural resource and land management sciences. Mapping issues and accuracy assessment are emphasized. Labs and term mapping project include hands-on experience with mapping-grade GNSS receivers and work with Trimble post-processing and ESRI software. Introduction to high-accuracy and survey mapping concepts.

GPHY 358. GPS Mapping Srvc Learning. 1 Credit. (1 Rec) F
COREQUISITE: GPHY 357. Participation in one of three established GPHY 357 service-learning projects: 1) Gallatin County Search and Rescue (SAR) trail mapping; 2) Urban mapping projects with City of Bozeman GIS; 3) AGAI canal mapping to update the Gallatin Valley inventory of water resources.

GPHY 365. Geographical Planning. 3 Credits. (3 Lec) S
PREREQUISITE: GPHY 121D. Planning history in the U.S.; Main factors, elements, organization, and issues of urban and rural planning in a geographical context; main principles, methods and tools of geographical planning; integration of physical and human variables into the planning process.

GPHY 384. Adv GIS and Spatial Analysis. 3 Credits. (2 Lec, 1 Lab) S

GPHY 402. Water and Society. 3 Credits. (3 Lec) F
PREREQUISITE: Junior, senior, or graduate student standing. This course introduces students to the study of relationships between people and the environment from a social science perspective. It explores the social causes and consequences of environmental change and examines the different approaches to decision-making about environmental issues. Co-convened with GPHY 502.

GPHY 411. Biogeography. 3 Credits. (3 Lec) S
Offered odd years. PREREQUISITE: GPHY 121D or BIOB 170IN. Factors affecting the geography of plants and animals in space and time.

GPHY 425. Geographic Thought. 3 Credits. (3 Lec) F
PREREQUISITE: Senior standing in Geography program. A senior capstone course for the geography option. The exploration of the history of geographic thought; the emergence and evolution of modern academic and applied geography. Contemporary trends and issues in geography through a service learning project.

GPHY 426. Remote Sensing. 3 Credits. (2 Lec, 1 Lab) F
PREREQUISITE: Junior standing or consent of instructor. This course is intended for students not in geospatial or GIS majors or minors. Theory and application of remote sensing, the electromagnetic spectrum, earth-energy interactions, and operation of multispectral sensors. Applications include satellite image analysis for agriculture, environmental assessment, forestry, geology, rangeland, urban, wildlife, and others.

GPHY 429R. Applied Remote Sensing. 3 Credits. (2 Lec, 1 Lab) F alternate years, to be offered odd years.
PREREQUISITE: ERTH 101IN or ERTH 303, STAT 216Q, Senior standing. Corequisite: ERTH 303. Local, regional, and global importance of mountains. Geomorphology, climatology, and hydrology of mountain environments, and their relationship to human activities.

GPHY 441R. Mountain Geography. 4 Credits. (2 Lec, 2 Lab) F alternate years, to be offered odd years.

GPHY 445. Adv. Regional Geography. 3 Credits. (3 Lec) F
PREREQUISITE: Two of the following: ERTH 101IN, GPHY 141D, or GPHY 212D. A topical and regional analysis of related political subdivisions or other geographical areas. Course may be taken twice if regional emphases differ. Co-convened with GPHY 545.

GPHY 461. Tourism Planning. 3 Credits. (3 Lec) S
PREREQUISITE: GPHY 284 and GPHY 365. Concepts and components of tourism system; types and geographical patterns of main tourism resources; methods and theories in tourism geography studies; case analyses of tourism planning at site, regional and national scale.

GPHY 484R. Applied GIS & Spatial Analysis. 3 Credits. (2 Lec, 1 Lab) S
PREREQUISITE: GPHY 384, either STAT 217Q or STAT 332, and consent of instructor. Advanced spatial analysis, synthesis and modeling concepts and methods. Semester projects apply theory and concepts to a project related to student's discipline. Students learn to develop GIS applications to address a variety of issues.

GPHY 490R. Undergraduate Research. 1-6 Credits. (1 Ind; 12 cr max) F, Su
PREREQUISITE: Consent of instructor. Directed undergraduate research which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research. May be repeated.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Type</th>
<th>Prerequisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>GPHY 491</td>
<td>Special Topics</td>
<td>1-4</td>
<td>Ind, On Demand</td>
<td>Course prerequisites as determined for each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand. Co-convened with GPHY 591.</td>
</tr>
<tr>
<td>GPHY 492</td>
<td>Independent Study</td>
<td>1-3</td>
<td>Ind, On Demand</td>
<td>Junior standing, consent of instructor, and approval of department head. Directed research and study on an individual basis.</td>
</tr>
<tr>
<td>GPHY 494</td>
<td>Seminar</td>
<td>1</td>
<td>Sem</td>
<td>Junior standing and as determined for each offering. Topics at the upper division level not covered in regular courses. Students participate in preparing and presenting discussion material.</td>
</tr>
<tr>
<td>GPHY 496</td>
<td>Geography Instruction</td>
<td>1-2</td>
<td>Ind</td>
<td>Junior standing and as determined for each offering. This course introduces students to the study of relationships between people and the environment from a social science perspective. It explores the social causes and consequences of environmental change and examines the different approaches to decision-making about environmental issues. Co-convened with GPHY 402.</td>
</tr>
<tr>
<td>GPHY 502</td>
<td>Water and Society</td>
<td>3</td>
<td>Lec</td>
<td>Graduate student standing. This course introduces students to the study of relationships between people and the environment from a social science perspective. It explores the social causes and consequences of environmental change and examines the different approaches to decision-making about environmental issues. Co-convened with GPHY 402.</td>
</tr>
<tr>
<td>GPHY 503</td>
<td>Settlement Geography</td>
<td>3</td>
<td>Sem</td>
<td>Graduate standing. Settlement history and contemporary land use in the trans-Mississippi west. Evolution of cultural landscapes in the Mountainous West.</td>
</tr>
<tr>
<td>GPHY 504</td>
<td>GIS Research Fundamentals</td>
<td>3</td>
<td>Lec, Lab</td>
<td>Graduate standing. Geographic Information Science Fundamentals in the context of developing a research program. Spatial data principles, data models, conversion and sampling strategies, analysis methods and cartography. Lab exercises uses GIS software. Students specialty area explored through literature review and individual project. Lecture co-convened with GPHY 384.</td>
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<tr>
<td>GPHY 505</td>
<td>Bioclimatography</td>
<td>3</td>
<td>Sem</td>
<td>Geography and Climate. The distribution of plants, as controlled by climate, geologic history and geographic location. Changes over time in distribution patterns as related to climate change and other human activities.</td>
</tr>
<tr>
<td>GPHY 506</td>
<td>Topics in Resource Geography</td>
<td>3</td>
<td>Sem</td>
<td>Alternate Odd Years Resource geographers are concerned with the forces that shape resource development and its outcomes or landscapes, cultures and livelihoods. The goal of this seminar is to introduce and engage with fundamental and current scholarship that addresses resource development—its drivers and outcomes—from a geographic perspective. This is readings-intensive seminar.</td>
</tr>
<tr>
<td>GPHY 507</td>
<td>Topics in Political Ecology</td>
<td>3</td>
<td>Lec</td>
<td>Graduate standing or consent of instructor. This course surveys foundational and recent work in Political Ecology to provide an overview of the theories and methods commonly used in the subfield. This includes Marxist political economy, cultural ecology, and poststructural theories of nature.</td>
</tr>
<tr>
<td>GPHY 520</td>
<td>Land Use Planning</td>
<td>3</td>
<td>Sem</td>
<td>Graduate standing, history and philosophy of land use planning; application of geographical skills to contemporary land use planning issues. Selected topics include population pressure and land requirement, law, eminent domain, property right, public control over private land use, institution, and economics in land use planning.</td>
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<tr>
<td>GPHY 545</td>
<td>Adv Regional Geography</td>
<td>3</td>
<td>Lec</td>
<td>Two of the following: ERTH 101, GPHY 121, or GPHY 141. A topical and regional analysis of related political subdivisions or other geographical areas. Course may be taken twice if regional emphases differ. Co-convened with GPHY 445.</td>
</tr>
<tr>
<td>GPHY 575</td>
<td>Professional Paper</td>
<td>1-6</td>
<td>Ind, On Demand</td>
<td>Consent of Instructor. A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major advisor and graduate committee. Dept of Earth Sciences.</td>
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