

GPHY - Geography

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)

(F, Sp) Resume of major world regions; their cultures, populations, resources, utilization of land; emphasis on regions outside Anglo-America.

GPHY 284 Intro to GIS Science & Cartog: 3 Credits (2 Lec, 1 Lab)

(F, Sp) 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, map 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 Other)

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. Repeatable up to 99 credits.

GPHY 291 Special Topics: 1-4 Credits (1-4 Lec)

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. Repeatable up to 12 credits.

GPHY 321 Urban Geography: 3 Credits (3 Lec)

PREREQUISITE: GPHY 121D or GPHY 141D. () Offered Spring, odd years. 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)

PREREQUISITE: GPHY 121D and STAT 216Q. () Offered Spring, even years. 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)

PREREQUISITE: GPHY 121D or GPHY 141D. (F) Global cultural landscape evolution; relationships between societies and their physical/political/social environments; cultural practices, identities, and spatialities

GPHY 326 Geography of Energy Resources: 3 Credits (3 Lec)

PREREQUISITE: GPHY 121 OR GPHY 141D. (Sp) 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)

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 Credits (1 Other)

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)

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)

PREREQUISITE: GPHY 284 and consent of instructor. (F, Sp) Advanced data model concepts in the context of spatial analysis. Spatial overlay analysis and synthesis in vector and raster. Error and Uncertainty. Data modeling and database design principles to support analysis and modeling applications. Co-convened with GPHY 504

GPHY 401 Environmental Planning and Management Toolkit: 3 Credits (3 Lec)

(Fall, even years.) Co-convened with GPHY 501. Environmental Planning and Management Toolkit is an introduction to social science research and participatory planning methods, including research design, data collection, data analysis, and communication. Focusing on research and participatory stakeholder engagement process design through a community partnership that focuses on an environmental issue. In addition to building a toolkit of social science research and participatory planning methods, there will be emphasis on research and planning ethics and positionality of the researcher/project manager within environmental planning and management. This course is designed to make you more effective in your own professions through thinking broadly about social, ecological, and economic issues, as well as when interacting with the planning process.

GPHY 402 Water and Society: 3 Credits (3 Lec)

PREREQUISITE: Junior, senior, or graduate student standing. () Offered Fall, even years. 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 408 Advanced Geospatial Analysis for Earth Sciences: 3 Credits (3 Lec)

PREREQUISITE: GPHY 484R or instructor approval. (F) This course emphasizes the practical and research applications of geospatial and temporal analysis in the study of snow, water, and ice resources. Students will participate in lectures, hands-on labs, and field experiences. It is recommended that students have taken ENSC 444 (Watershed Hydrology) and/or EARTH 450 (Snow Dynamics and accumulation)

GPHY 411 Biogeography: 3 Credits (3 Lec)

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)

PREREQUISITE: Senior standing in Geography program. (Sp) 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 independent research projects. Development of a capstone e-Portfolio documenting career goals and MSU journey

GPHY 426 Remote Sensing: 3 Credits (1 Lec, 2 Lab)

PREREQUISITE: GPHY 284. (Sp) This course will cover the fundamentals of remote sensing for the natural sciences, including theory and physical principles of radiometry, data acquisition by active and passive sensors, and basic processing and analysis methods. Students will learn which remote sensing data are useful for investigating questions related to vegetation and soil science, geologic mapping, animal movement and behavior, and other topics, and how to query relevant data repositories. Students will learn basic data processing, including radiometric, geometric, and atmospheric processing, and data analysis, including classification and regression. There is no prior coding experience required for this course. Labs will be conducted using open-source and commercial platforms, including Google Earth Engine, ENVI, and ArcGIS Pro

GPHY 429R Applied Remote Sensing: 3 Credits (1 Lec, 2 Lab)

PREREQUISITE: GPHY 284. (Sp) This course is for students from all backgrounds interested in using remote sensing as a tool for their fields of study. Emphasis is put on physical principles of active and passive remote sensing, data discovery, basics of campaign planning, data analysis, modifying and writing custom code in R or a coding language of choice, and digital cartography. In the lab, students will use remote sensing data to investigate their own research questions or one of the topics/questions provided. Graduate students are expected to generate and analyze research questions related to the graduate program exceptions are possible

GPHY 441R Mountain Geography: 4 Credits (2 Lec, 2 Lab)

PREREQUISITE: EARTH 101IN and EARTH 303, STAT 216Q, Junior standing
COREQUISITE: EARTH 303. () Offered Fall, odd years. Local, regional, and global importance of mountains. Geomorphology, climatology, and hydrology of mountain environments, and their relationship to human activities

GPHY 445 Adv. Regional Geography: 3 Credits (3 Lec)

PREREQUISITE: Two of the following: EARTH 101IN, GPHY 141D, or GPHY 121D. () Offered Fall, odd years. 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 Repeatable up to 6 credits.

GPHY 471R Data Science for Climate and Sustainability Analysis: 3 Credits (2 Lec, 1 Lab)

(F) Consent of instructor. Learn Python data science tools to understand climate change and sustainability challenges. Focus on integrating US Census, OpenStreetMap, remote-sensed and weather/climate datasets using MSU Tempest Computing Cluster. Students will develop self-directed final projects. Prior coding experience recommended, but not required. Co-convened with GPHY 571.

GPHY 484R Applied GIS & Spatial Analysis: 3 Credits (2 Lec, 1 Lab)

PREREQUISITE: GPHY 384 and STAT 332 or STAT 337. (Sp) 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 Other)

PREREQUISITE: Consent of instructor. (F, Sp, Su) 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 Repeatable up to 12 credits.

GPHY 491 Special Topics: 1-4 Credits (1-4 Lec)

PREREQUISITE: Course prerequisites as determined for each offering. Offered on demand. 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 Repeatable up to 12 credits.

GPHY 492 Independent Study: 1-3 Credits (1-3 Other)

PREREQUISITE: Junior standing, consent of instructor, and approval of department head. (F, Sp, Su) Directed research and study on an individual basis Repeatable up to 6 credits.

GPHY 494 Seminar: 1 Credits (1 Other)

PREREQUISITE: 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 Repeatable up to 4 credits.

GPHY 497 Geography Instruction: 1-2 Credits (1 Lab)

PREREQUISITE: Junior or senior standing in geography and consent of instructor and Department Head. Student works as a tutor and undergraduate teaching assistant in a teaching laboratory under close academic supervision. Weekly meeting focuses on geography teaching, organization of class materials, and student supervision. Weekly lab emphasizes applying active learning concepts in a geography laboratory context Repeatable up to 4 credits.

GPHY 498 Internship: 2-12 Credits (2-12 Other)

PREREQUISITE: Junior standing, consent of instructor, and approval of department head. (F, Sp, Su) An individualized assignment arranged with an agency, business or other organization to provide guided experience in the field Repeatable up to 12 credits.

GPHY 501 Environmental Planning and Management Toolkit: 3 Credits (3 Lec)

(F) Co-convened with GPHY 401. Environmental Planning and Management Toolkit is an introduction to social science research and participatory planning methods, including research design, data collection, data analysis, and communication. Focusing on research and participatory stakeholder engagement process design through a community partnership that focuses on an environmental issue. In addition to building a toolkit of social science research and participatory planning methods, there will be emphasis on research and planning ethics and positionality of the researcher/project manager within environmental planning and management. This course is designed to make you more effective in your own professions through thinking broadly about social, ecological, and economic issues, as well as when interacting with the planning process.

GPHY 502 Water and Society: 3 Credits (3 Lec)

PREREQUISITE: Graduate student standing. (F) Offered Fall, even years. 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

GPHY 504 GIS Research Fundamentals: 3 Credits (2 Lec, 1 Lab)

PREREQUISITE: Graduate standing. (F) 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

GPHY 506 Topics in Resource Geography: 3 Credits (3 Other)

() Offered Fall, even 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.

GPHY 507 Topics in Political Ecology: 3 Credits (3 Lec)

PREREQUISITE: Graduate standing or consent of instructor. () Offered Spring, even years. 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

GPHY 508 Advanced Geospatial Analysis for Earth Sciences: 3 Credits (2 Lec, 1 Lab)

(F) It is recommended that students have taken ENSC 444 (Watershed Hydrology) or ENSC 445 (Watershed Analysis), and/or EARTH 450 (Snow Dynamics and Accumulation). This course emphasizes the practical and research applications of geospatial and temporal analysis in the study of snow, water, and ice resources. Students will participate in lectures, hands-on labs, and field experiences.

GPHY 520 Land Use Planning: 3 Credits (3 Other)

PREREQUISITE: Graduate standing. () Offered Fall, odd years. 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

GPHY 545 Adv Regional Geography: 3 Credits (3 Lec)

PREREQUISITE: Two of the following: EARTH 101, GPHY 121, or GPHY 141. () Offered Fall, odd years. 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

GPHY 571 Data Science for Climate and Sustainability Analysis: 3 Credits (2 Lec, 1 Lab)

(F) Learn Python data science tools to understand climate change and sustainability challenges. Focus on integrating US Census, OpenStreetMap, remote-sensed and weather/climate datasets using MSU Tempest Computing Cluster. Students will develop self-directed final projects. Prior coding experience recommended, but not required. Co-convened with GPHY 471.

GPHY 575 Professional Paper: 1-6 Credits ()

PREREQUISITE: 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.

Repeatable up to 6 credits.

GPHY 591 Special Topics: 1-4 Credits (1-4 Lec)

PREREQUISITE: Graduate Standing; Upper division courses and others as determined for each offering. Offered on demand. 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

Repeatable up to 12 credits.

GPHY 592 Independent Study: 1-4 Credits (1-4 Other)

PREREQUISITE: Graduate standing, consent of instructor, approval of department head and Dean of Graduate Studies. (F, Sp, Su) Directed research and study on an individual basis

Repeatable up to 6 credits.

GPHY 594 Seminar: 1 Credits (1 Other)

PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering. Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material