GEOG 603 Processes in Economic Geography  
Credits 3. 3 Lecture Hours.  
Spatial organization and distribution of economic activity; patterns of land rent and land use; theories of economic development; models of spatial decision making.  
Prerequisite: GEOG 304 or equivalent or approval of instructor.

GEOG 604 Processes in Physical Geography  
Credits 3. 3 Lecture Hours.  
Methodologies and problems of physical geography with emphasis on the interrelationships of the physical environment; a foundation course for graduate work in geography.  
Prerequisite: Approval of instructor.

GEOG 605 Processes in Cultural Geography  
Credits 3. 3 Lecture Hours.  
Evolution of cultural landscapes; processes of innovation, diffusion and adaptation in context of developing human-environment relationships.  
Prerequisite: Approval of instructor.

GEOG 610 Geographical Methods and Theory  
Credits 3. 3 Lecture Hours.  
Development of geography as a discipline; methods and theories used in geography for understanding place and for spatial analysis of human and biophysical phenomena.  
Prerequisite: Graduate classification in geography or approval of instructor.

GEOG 611 Geographical Research Design  
Credits 3. 3 Lecture Hours.  
Methods, techniques and conceptual models for the conception, design, planning and conduct of geographical research.  
Prerequisite: Graduate classification in geography or approval of instructor.

GEOG 612 Applied Climatology  
Credits 3. 3 Lecture Hours.  
Climate data and methods to solve a wide range of environmental problems; collection, processing, analysis and interpretation of surface observations, radar, satellite, reanalysis and climate model data; statistical methods and physical modeling; practical problems and development of tools for decision makers.  
Prerequisite: Graduate classification.

GEOG 616 Urban Geography  
Credits 3. 3 Lecture Hours.  
Spatial patterns and processes of urban systems; growth and sprawl; environmental impacts; residential choice models; political fragmentation; economic development; power and privilege; place-based identity.  
Prerequisite: GEOG 306 or equivalent.

GEOG 619 Human Impact on the Environment  
Credits 3. 3 Lecture Hours.  
Human alterations of landscapes, the atmosphere and the waters of the earth; interference with natural chemical cycles; disturbance of ecological equilibria; depletion of natural resources; roles of technology and population growth.  
Prerequisite: Approval of instructor.

GEOG 621 Land-Use and Land-Cover Change  
Credits 3. 3 Lecture Hours.  
Human dimensions of land-use and land-cover change; theories of global and regional land-use and land-cover changes that emphasize processes, institutions, and patterns at multiple scales; methodologies and research agendas including geo-spatial analysis, modeling, and social science approaches.  
Prerequisites: GEOG 619 or approval of instructor; Graduate classification.

GEOG 624 Biogeography: Theory and Methods  
Credits 3. 3 Lecture Hours.  
Theory and methods utilized in contemporary biogeography; emphasis on the analysis of vegetation communities and their environmental controls; various methods of ordination and predictive methods for analyzing vegetation ranges; spatial analysis of vegetation.  
Prerequisite: Approval of instructor.

GEOG 625/ENTO 625 Landscape Ecology  
Credits 3. 2 Lecture Hours. 2 Lab Hours.  
Study of structure, function, and change in a heterogeneous land area composed of interacting ecosystems; examine basic ecological principles dealing with landscape structure.  
Prerequisite: Approval of instructor.  
Cross Listing: ENTO 625/GEOG 625.

GEOG 626 Fluvial Geomorphology  
Credits 3. 3 Lecture Hours.  
Processes and landforms in dryland environments; nature and dynamics of gravity, water and wind in deserts; Quaternary climates and arid lands; human impact in drylands.  
Prerequisite: GEOG 203 or approval of instructor.

GEOG 627 Arid Lands  
Credits 3. 3 Lecture Hours.  
Processes and landforms in dryland environments; nature and dynamics of gravity, water and wind in deserts; Quaternary climates and arid lands; human impact in drylands.  
Prerequisite: GEOG 604 or approval of instructor.

GEOG 629 Cultural and Political Ecology  
Credits 3. 3 Lecture Hours.  
History of ideas about humans and environment; political and social meanings of nature and culture; access and control of resources; theories of environmental change; geographic approaches to political ecology research; current debates and future directions.  
Prerequisite: Graduate classification.

GEOG 634/WMHS 601 Hydrology and Environment  
Credits 3. 3 Lecture Hours.  
Examination of hydrologic processes affecting surface and groundwater resources; impact of climate, soils, vegetation, land-use practices, and human effects on hydrologic processes; natural-scientific perspectives emphasized.  
Prerequisite: Graduate classification.  
Cross Listing: WMHS 601/GEOG 634.

GEOG 635 Advanced Biogeography  
Credits 3. 3 Lecture Hours.  
Theory and contemporary research in biogeography; methods used in conducting biogeographical research; spatial and temporal changes in the distribution of organisms; influences of humans and the physical environment on biogeographic patterns.  
Prerequisite: GEOG 624 or approval of instructor.
GEOG 642/GEOS 642 Past Climates
Credits 3. 3 Lecture Hours.
Terrestrial and marine proxy records of past climate variability, including
tree rings, coral, and sediments; past climate change events such as the
Little Ice Age and Medieval Warm Period; greenhouse gases and global
temperature; insight into the nature of climate change and challenges
humbankind faces in the next few centuries.
Prerequisite: Graduate classification.

GEOG 644 Geographic Education: Theory and Practice
Credits 3. 3 Lecture Hours.
Geography as an element of the educational system including K-12,
undergraduate, graduate; geography's role in curricula and its practice in
classrooms; course design and integration of geographic concepts into
classroom instruction.
Prerequisite: Graduate classification.

GEOG 645 Research in Geographic Education
Credits 3. 3 Lecture Hours.
Research in geographic education and the interface between research
in geography and geographic education; identification of research
questions; choice of methodology; review of literature; data collection
and analysis; communication of results.
Prerequisite: Graduate classification.

GEOG 648 Political Geography of the World-System.
Credits 3. 3 Lecture Hours.
Political and geopolitical evolution of the modern world-system; major
geopolitical theories, settler colonization, extractive colonization,
imperialism, decolonization, development of European state-system
hegemonic change and theory of world leadership cycles.
Prerequisite: Graduate classification.

GEOG 651 Remote Sensing for Geographical Analysis
Credits 3. 3 Lecture Hours. 1 Lab Hour.
Provides and introduction to remote sensing fundamentals. Discussion
of past, present and planned earth observing sensors as well as technical
issues involved in the collection, processing and interpretation of remote
sensing images with emphasis on application to geographic problems,
including geomorphology, hydrology and coastal oceanography.
Prerequisite: Graduate classification.

GEOG 652 Quantitative Methods in Geography
Credits 3. 3 Lecture Hours.
Designed to acquaint with quantitative methods commonly used in
geographical research to describe, characterize, model and analyze geo-
spatial data.
Prerequisite: Approval of instructor.

GEOG 659 Geodatabases
Credits 3. 3 Lecture Hours. 1 Lab Hour.
GIS data modeling; introductory and advanced spatial SQL (structured
query language); spatial database management system (DBMS)
server setup, management and maintenance; spatial DBMS design,
implementation, tuning, performance analysis and indexing; connecting
spatial data services and warehouses to GIS software.

GEOG 660 Applications in GIS
Credits 3. 3 Lecture Hours. 1 Lab Hour.
Basic concepts of design, planning, and implementation of geographic
information systems.
Prerequisite: Graduate classification.

GEOG 661 Digital Image Processing and Analysis
Credits 3. 3 Lecture Hours. 1 Lab Hour.
Principles of georectifying, processing, manipulating and interpreting
data collected by nonphotographic sensors concentrating on solid earth
resources.
Prerequisite: GEOG 651 or equivalent or approval of instructor.

GEOG 662 GIS in Land and Property Management
Credits 3. 3 Lecture Hours. 1 Lab Hour.
Introduction to concepts of design, planning and implementation
of geographic information systems (GISes) for land and property
management applications; rural land and agricultural property; urban and
residential land uses; cadastral surveying.
Prerequisite: GEOG 604 or equivalent or approval of instructor.

GEOG 663 GIS-Based Spatial Analysis and Modeling
Credits 3. 3 Lecture Hours. 1 Lab Hour.
Investigates methodology of integrating various spatial analysis and
modeling techniques with GIS for environmental/socio-economic
applications; practical applications; theoretical/technical aspects of
related issues in detail.
Prerequisite: GEOG 660 or equivalent or approval of instructor.

GEOG 666 Coastal Geomorphology
Credits 3. 3 Lecture Hours.
Essential concepts and methods to coastal geomorphology; review
history and processes of coastal geomorphology; analytical treatment of
problems associated with coastal environmental changes.
Prerequisite: GEOG 203 or equivalent.

GEOG 667 Dynamic Modeling of Earth and Environmental Systems
Credits 4. 3 Lecture Hours. 2 Lab Hours.
Dynamical systems modeling; dynamic complexity; key concepts,
processes and human impact on earth and environmental systems;
model building and testing; system behavior over time; model
validation and sensitivity; examples from the applications in earth and
environmental sciences.
Prerequisite: Approval of instructor.

GEOG 668 Arctic Climates
Credits 3. 3 Lecture Hours.
Arctic climate system, physical characteristics and climatic features,
the atmospheric energy budget, the atmospheric circulation, the surface
energy budget, the hydrologic cycle, and the interactions between the
atmosphere, Arctic Ocean, and the sea ice cover.
Prerequisite: Graduate classification.

GEOG 669 GIS Programming
Credits 3. 3 Lecture Hours. 1 Lab Hour.
Automation of GIS software; integration of custom code as extensions
into GIS software; programmatic manipulation of GIS data.
Prerequisite: Graduate classification.

GEOG 670 Geomorphometry
Credits 3. 3 Lecture Hours.
Introduction to discipline of geomorphometry; science of quantitative
land-surface characterization; fundamental principles of terrain analysis;
theory and concepts of land-surface and dynamics; software and digital
terrain modeling; production of land-surface parameters and objects and
terrain mapping applications.
Prerequisites: Equivalent of GEOG 361 and GEOG 390, or approval of
instructor; graduate classification.
GEOG 678 WebGIS
Credits 3. 3 Lecture Hours. 1 Lab Hour.
Internet architectures; setup, management and maintenance of web-based Geographic Information System (WebGIS) servers, data and services; use of WebGIS data and services in the creation of custom web-based maps; analysis of WebGIS system architecture, design and implementation.
Prerequisite: Graduate classification.

GEOG 680 Geomorphometry
Credits 3. 3 Lecture Hours.
Introduction to the discipline of geomorphometry representing the science of quantitative land-surface characterization; focus on the fundamental principles of terrain analysis; theory and concepts of land-surface and dynamics; software and digital terrain modeling; production of land-surface parameters and objects and terrain mapping applications.
Prerequisites: GEOG 361 or equivalent, GEOG 390 or approval of the instructor; graduate classification.

GEOG 681 Seminar
Credit 1. 1 Lecture Hour.
Reports and discussions of current research and selected topics.
Prerequisite: Approval of department head.

GEOG 685 Directed Studies
Credits 1 to 6. 1 to 6 Other Hours.
For students with major or minor in geography to undertake investigations in special aspects of geography.
Prerequisite: Approval of instructor.

GEOG 687/ANTH 624 Geoarchaeology
Credits 3. 3 Lecture Hours.
Application of geological concepts and methods to archaeological research; history of geoarchaeology; site formation processes; modification of archaeological sites and sediments; landscape reconstruction and change and their effects on human behavior.
Prerequisite: ANTH 602 or equivalent.
Cross Listing: ANTH 624/GEOG 687.

GEOG 689 Special Topics in...
Credits 1 to 4. 1 to 4 Lecture Hours. 0 to 4 Lab Hours.
Selected topics in an identified area of geography. May be repeated for credit.
Prerequisite: Approval of instructor.

GEOG 691 Research
Credits 1 to 23. 1 to 23 Other Hours.
Original research in various areas of geography. Research for thesis or dissertation.

GEOG 695 Frontiers in Geographic Information Science
Credits 3. 3 Lecture Hours.
Theoretical foundations and the latest development of geographic information science (GI Science); topics related to representations of space and time, geocomputation, spatially integrated social sciences, and social informatics.
Prerequisite: Introductory GIS.

GEOG 696 Geomorphology and Remote Sensing
Credits 3. 3 Lecture Hours.
Application of remote sensing to study landforms, imagery, includes, aerial photography; LANDSAT; SPOT, TM and shuttle photography.
Prerequisite: GEOG 203 or approval of instructor.