October 1, 2015
Proposal for GEOG course designator

http://oregonstate.edu/admin/aa/apaa/course-designators

Procedural Steps:

1. *The academic unit contacts the office of Academic Programs, Assessment, and Accreditation @ 7-9560, or via email to the Curriculum Coordinator, with a proposal to create a new course designator, including a justification for the proposal.*
2. *The proposer responds to the questions set forth in* ***Request for New or Changed Course Designator*** *(see below) and emails responses to APAA.*
3. *The Curriculum Coordinator in APAA will contact the Registrar's Office to confirm the availability of the proposed course designator.*
4. *The Curriculum Coordinator will submit the proposed course designator to the Curriculum Council for review and approval.*
5. *Following approval by the Curriculum Council, the Curriculum Coordinator will submit an expedited proposal in the Curricular Proposal System (CPS).*
6. *The Registrar's Office then moves forward with implementation of the new course designator.*
7. *Once a course designator is approved, the academic unit seeking to convert their courses to the new designator will send the list of these courses to APAA. APAA will change the course designators via expedited proposals, without the inclusion of syllabi.*

Request for New or Changed Course Designator:
Requests for new or changed course designators are reviewed by the Registrar's Office and by the Curriculum Council of the Faculty Senate. Proposers should contact the Office of Academic Programs, Assessment, and Accreditation to initiate a designator request.
Creation or alteration of a course designator constitutes a change in the curricular structure of the university. Such a change has implications for the catalog, schedule of classes, BANNER Student Information Systems, MyDegrees, and transfer articulation. Accreditation standards require that designators be "consistent with program content in recognized fields of study."

Designator requests should be prepared in writing and should address Purpose, Accountability, and Impact of the new designator. Additional details for addressing these considerations are given below.

Purpose: *The proposed course designator should have an identified purpose within the curricular structure of Oregon State University.*

- *What academic programs, including majors, certificates, options and minors will be served by courses within the designator?*

The GEOG course designator is proposed for courses in the discipline of Geography. It will serve the new Geography and Geospatial Science major, the GIScience certificate, and many courses included in many options and minors. It will partially replace the GEO designator, currently assigned to Geography courses (see list attached).

History: The GEO designator was created ~1990 to replace the former GEOG and GEOL designators at the time of the merger of the former departments of Geography and Geology at OSU (in 1990). The Department of Geosciences was dissolved in 2011, when it merged with COAS to become the new College of Earth, Ocean, and Atmospheric Sciences (CEOAS). At

that time, Geography and Geology moved into separate discipline groups within CEOAS, and the associated degree programs in Geography and Geology have been administered separately within CEOAS since that time.

There are three motivations for this request:
(1) The lack of a GEOG designator at Oregon State University contributes to confusion and ignorance among students who do not understand the difference between the disciplines of Geography (study of the nature and relative arrangement of places, human cultures, and physical features) and Geology (study of the earth's physical structure and substance, its history, and the processes that act on it). Over the past few decades, virtually every aspect of society has been revolutionized by geographic information technology, which is used by individuals to navigate and make daily decisions; by farmers to manage crops; by governments to collect intelligence, manage natural resources, and respond to disasters; and by businesses to plan and locate activities. In our globalized world, understanding places and the relative arrangement of places, human cultures, and physical features is an increasingly critical element of citizenship. Given this, it is stunning to consider that very few people (including educated people) understand the distinction between Geography and Geology. Because students overwhelmingly interpret "GEO" to mean Geology, the use of the GEO designator obscures the existence of Geography at OSU.

(2) The use of the GEO designator, combined with the growth of new courses, and the restriction on re-use of course numbers, has led to a course numbering system at OSU in which courses in Geography and Geology are jumbled together and not logically numbered. The current GEO course numbering system is extremely confusing for students, advisors, and faculty. Reinstatement of the GEOG designator will assist students, staff, and faculty, by permitting a rational course numbering system.

(3) Our peer institutions overwhelmingly use the GEOG designator to designate courses in Geography.

- *In what ways do the general area and scope of the content constitute a coherent body of knowledge?*

Geography is an ancient and modern discipline - one of the earliest academic disciplines in western culture. See e.g., https://en.wikipedia.org/wiki/Geography. Professional organizations include the Associate of American Geographers, the National Geographic Society, and others. All major universities in the United States offer undergraduate and graduate degrees in Geography, see http://www.aag.org/galleries/publications-files/20142015_Guide_to_Geography_Programs_in_the_Americas.pdf.

- *Is the proposed usage of the designator consistent with practice at OSU and other institutions? Give examples.*

Oregon State University's Geography program ranked 12th in the National Research Council's ranking of top geography programs in the United States, see http://chronicle.com/article/NRC-Rankings-Overview-/124734/. Twenty-one of the top 30 highest-ranked degree programs in Geography use the designator GEOG. Asterisks indicate our peer institutions among the Carnegie Research institutions with the "very high" research category (See for example:

Clark University (rank 3):
http://catalog.clarku.edu/preview_program.php?catoid=7&poid=641#MajorRequirements
*Indiana University (rank 5): http://bulletins.iu.edu/iub/college/2015-2016/departments/geography/courses.shtml

Kansas State University (rank 6): http://catalog.k-state.edu/preview_program.php?catoid=13&poid=3284&bc=1
*Louisiana State University (rank 8): http://catalog.lsu.edu/preview_program.php?catoid=1&poid=134&returnto=42
*Ohio State University (rank 10): https://geography.osu.edu/undergrad/majors/climate/curriculum, https://geography.osu.edu/undergrad/majors/gis/curriculum
Oklahoma State University (rank 11): http://geog.okstate.edu/undergraduate-program/bs-in-geography?task=view&id=43
*Pennsylvania State University (rank 13): http://www.geog.psu.edu/academics/courses
San Diego State University/UCSB (rank 15): http://geography.sdsu.edu/Programs/ugrad.html
Southern Illinois University (rank 16): http://cola.siu.edu/geography/undergraduate/
*Texas A&M University (rank 18): http://catalog.tamu.edu/undergraduate/geosciences/geography/#coursestext
*University of California at Berkeley (rank 21): http://geography.berkeley.edu/undergraduate-studies/major-and-minor-program-details/
*University of California at Los Angeles (rank 23): http://www.geog.ucla.edu/sites/default/files/assets/academics/geog_major_15w.pdf
*University of California- Santa Barbara (rank 24): https://my.sa.ucsb.edu/catalog/Current/CollegesDepartments/ls-intro/geog.aspx?DeptTab=Courses
*University of Colorado-Boulder (rank 26): http://geography.colorado.edu/undergrad_program/curriculum/required_courses
*University of Connecticut (rank 27): http://geography.uconn.edu/undergrad/bs-geog/
*University of Georgia (rank 29): http://geography.uga.edu/b.s.-program-requirements/

Nine of these do not use GEOG as a designator. These are mostly Geography programs housed within large schools, and designators vary, including GE, GEO, GIS, GEA. Geography programs using "GEO" as course designator are typically housed in Colleges of Social Sciences, where they cannot be confused with Geology courses (e.g., ASU, Florida State, Michigan State), or in schools that combine Geology and Geography (e.g., Boston Univ.)
*Arizona State University (School of Geographical Sciences and Urban Planning) (rank 1): https://geoplan.asu.edu/academics/undergraduate-studies/about-undergraduate-geography-programs/undergraduate-courses
*Boston University (School of Earth and Environment) (rank 2): http://www.bu.edu/academics/cas/programs/earth-environment/ba-in-geography%E2%80%94human-geography-specialization/
*Florida State University (College of Social Sciences) (rank 4): http://coss.fsu.edu/geography/Students/undergraduate_program.html
*Michigan State University (College of Social Sciences) (rank 9): http://geo.msu.edu/undergraduate-information/undergraduate-degrees-2/
Syracuse University (rank 17): http://www.maxwell.syr.edu/geo/Undergraduate_Program/
*SUNY Buffalo (rank 19): https://www.buffalo.edu/cas/geography/undergraduate-programs/curriculum-and-requirements.html
*University of Arizona (rank 20): http://geography.arizona.edu/sites/geography.arizona.edu/files/BS%20in%20Geography%20sheet.pdf
*University of California at Davis (rank 22): http://geography.ucdavis.edu/classes
*University of Florida (rank 28): http://geog.ufl.edu/programs/undergrad/bs_requirements/

Accountability: *Responsibility for the integrity and oversight of the proposed course designator should be clearly identified.*

- *What is the academic College of the designator?*

CEOAS

- *Who is responsible for administering courses in the designator, e.g. scheduling and catalog updates. Who are the faculty contact persons?*

CEOAS Associate Dean for Academic Programs - Anita Grunder (curriculum and faculty course assignments)
CEOAS Student Services - Melinda Jensen (scheduling and catalog updates)
Geography Program Director - Julia Jones (curriculum and faculty course assignments)

- *Who is responsible for consistency and outcome assessment for courses in the designator?*

Geography Program Director - Julia Jones
Geography program faculty - see http://ceoas.oregonstate.edu/academics/geography/

- *Which units get credit for the SCH generated by courses in the subject code?*

CEOAS/Geography

- *Who is responsible for communicating information about the new designator to stakeholders, including advisors, Admissions, and students?*

CEOAS Student Services - advisors Kate Ullman, Stephany Johnson; Graduate student coordinators Robert Allan, Lori Hartline
Geography Program Director - Julia Jones

Impacts: *Who will benefit from the new designator and what changes will result from its implementation?*

- *Will courses in the new designator duplicate or compete with existing ones?*

No. The GEOG designator removes confusion. The GEOG designator will partially replace the GEO designator, currently assigned to Geography courses (see list, attached at the end of this document).

- *Are there expected cross-listings or curricular equivalencies?*

No.

- *How will the new designator affect transfer credits?*

Transfer credits will be managed as they currently are managed. Incoming students currently may apply credits earned in GEOG and GEO coursework elsewhere, and this will continue.

- *Will any previous existing designators expire as the new one appears?*

No, the GEO designator will continue to be used for Geology courses.

- *How will the new designator benefit students?*

The GEOG designator will resolve current confusion among undergraduates at Oregon State University who do not understand the differences between the disciplines of Geography and Geology, which are very distinct. Students overwhelmingly interpret "GEO" as meaning Geology.

In addition, the current sharing of the GEO designator means that Geography and Geology courses are intermixed somewhat haphazardly, and neither Geography nor Geology courses can

be numbered sequentially. The creation of the GEOG designator will permit a rational, easily comprehensible numbering system for courses in Geography. Removal of the Geography courses from the GEO designator also provides Geology with the freedom to number courses sequentially as needed.

Approval by Curriculum Council: *May 13, 2011*
Approval & Revisions: *This policy is being revised by APAA and will be submitted to the Curriculum Council for review and approval.*

- Signifies that the course is offered in current or future terms.
- Signifies the course as a Baccalaureate Core Course.
- Signifies the course as a WIC Core Course.
$ - Signifies that fees may apply to the course.
+ - Include restriction.
- - Exclude restriction.
*** - Prereq may be taken prior to or simultaneously with this course.**

GEO 102 THE SURFACE OF THE EARTH (4)
Processes that shape the earth's surface. Weathering mass movement, ice dynamics, biogeography, climate, surface and ground water flow. Use of maps and imagery. Lec/lab. (Bacc Core Course)

GEO 105 GEOGRAPHY OF THE NON-WESTERN WORLD (3)
An introduction to the rich variety of environments, population and settlement dynamics, cultures, geopolitical changes, and economies in Africa, the Middle East, and Asia. Lec/lab/rec. (Bacc Core Course)

GEO 105H GEOGRAPHY OF THE NON-WESTERN WORLD (3)
An introduction to the rich variety of environments, population and settlement dynamics, cultures, geopolitical changes, and economies in Africa, the Middle East, and Asia. Lec/lab/rec. (Bacc Core Course) **PREREQS:** Honors College approval required.

GEO 106 GEOGRAPHY OF THE WESTERN WORLD (3)
An introduction to the rich variety of environments, population and settlement dynamics, cultures, geopolitical changes, and economics in Europe and Russia, Australia and Oceania, and the Americas. (Bacc Core Course)

GEO 199 SPECIAL STUDIES (1-16)
This course is repeatable for a maximum of 16 credits.

GEO 204 CLIMATE CHANGE, WATER AND SOCIETY (3)
Introduction to social, ecological and economic impacts of climate change induced water problems in various geographic regions and cultures. Approaches to climate change mitigation and adaptation in various parts of the world. (Bacc Core Course)

GEO 205 GEOGRAPHY OF DISASTER MANAGEMENT (3)
Introduction to the geographic concepts and processes for effective disaster management, including response, recovery, mitigation and preparedness. Risk assessment and evidence-based best practices to prepare and respond to emergencies in a variety of geographic contexts. (Bacc Core Course)

GEO 296 INTRODUCTION TO GEOGRAPHIC FIELD RESEARCH (3)
Two-week course taught in the fall program in various locations throughout the west. Collect and analyze data associated with both human and physical geography. Lec/lab. **PREREQS:** GEO 201 and GEO 202

GEO 300 SUSTAINABILITY FOR THE COMMON GOOD (3)
Geography of human relationships to earth's systems with an emphasis on individual impacts and collective efforts to achieve environmental sustainability. Lec/rec. (Bacc Core Course) **PREREQS:** Upper-division standing.

GEO 300H SUSTAINABILITY FOR THE COMMON GOOD (3)
Geography of human relationships to earth's systems with an emphasis on individual impacts and collective efforts to achieve environmental sustainability. Lec/rec. (Bacc Core Course) **PREREQS:** Upper-division standing. Honors College approval required.

GEO 301 MAP AND IMAGE INTERPRETATION (4)
Reading, analysis, and interpretation of maps/remote sensing images used by geoscientists. Use of topographic,

geologic, nautical and other geoscience maps; basic air photo interpretation. Lec/lab.

GEO 304 GEOGRAPHY OF NATURAL HAZARDS (3)
Introduction to the geography of risk, natural hazards, and disasters; focusing on concepts of vulnerability, adaptation and resilience of human society in the Pacific Northwest and globally.

GEO 309 ENVIRONMENTAL JUSTICE (3)
Technical and social issues surrounding the unequal exposure to environmental hazards based on race and the environmental justice movement that has grown to address charges of such environmental racism. (Bacc Core Course) **PREREQS:** (WR 121 or WR 121H) and sophomore standing

GEO 323 CLIMATOLOGY (4)
Systematic analysis of global and regional climates. Physical principles of climate, climate classifications, and distribution and characteristics of climate regimes. Lec/lab. (Writing Intensive Course) **PREREQS:** GEO 102 or GEO 202 and GEO 101 and GEO 202

GEO 324 GEOGRAPHY OF LIFE: SPECIES DISTRIBUTIONS AND CONSERVATION (4)
Plant, animal, and biotic community distribution and dynamics. Effect of climate, tectonics, disturbance on extinction, speciation, and succession. Field trip(s) required; transportation fee charged. Lec/lab.

GEO 325 GEOGRAPHY OF AFRICA (3)
An introduction to the physical, historical, cultural, political, and development geography of Africa south of the Sahara. Offered alternate years. (NC) (Bacc Core Course)

GEO 326 GEOGRAPHY OF EUROPE (3)
A regional overview precedes a topical examination of Europe's diverse physical and cultural landscapes and lifestyles. (Bacc Core Course)

GEO 327 GEOGRAPHY OF ASIA (3)
Geographic analysis of Asia's lands and peoples. Emphasis on regional physical environments, resources and development potentials, population trends, and international importance to the United States. May not be offered each year. (NC) (Bacc Core Course)

GEO 328 GEOGRAPHY OF LATIN AMERICA (3)
Focuses on the diverse landscapes, peoples and cultural traditions of Latin America, a vast region extending from the United States-Mexican border to the southern tip of South America. (NC) (Bacc Core Course)

GEO 329 GEOGRAPHY OF THE UNITED STATES AND CANADA (3)
Cultural, economic, political, and settlement geography. Emphasis on regional patterns and problems. Analysis of recent and projected changes. (Bacc Core Course)

GEO 330 GEOGRAPHY OF INTERNATIONAL DEVELOPMENT AND GLOBALIZATION (3)
Introduction to the geography of global wealth and inequality with a focus on contemporary development, underdevelopment, and globalization problems in Asian, African, Caribbean, Latin American, and Pacific Island countries. (Bacc Core Course) (Writing Intensive Course) **PREREQS:** GEO 105 or GEO 106 or instructor approval.

GEO 335 INTRODUCTION TO WATER SCIENCE AND POLICY (3)
Policy and science of the hydrologic cycle. Emphasis on interaction between water's natural time-space fluctuations and human uses. (Bacc Core Course) CROSSLISTED as SOIL 335.

GEO 335H INTRODUCTION TO WATER SCIENCE AND POLICY (3)

Policy and science of the hydrologic cycle. Emphasis on interaction between water's natural time-space fluctuations and human uses. (Bacc Core Course) **PREREQS:** Honors College approval required.

GEO 350 POPULATION GEOGRAPHY (3)
Patterns of spatial distribution of human populations, data sources, data display, population structure and dynamics, relationship between population, resources, and quality of life. Problems of growth and alternative futures. Offered alternate years. (SS) (Bacc Core Course) **PREREQS:** Upper-division standing.

GEO 360 CARTOGRAPHY (4)
Basic cartographic principles. Design, compilation, and construction of maps. Lec/lab.

GEO 365 INTRODUCTION TO GEOGRAPHIC INFORMATION SYSTEMS (4)
Introduction to the principles of geographic information systems (GIS) and experience using a widely popular geographic information system for spatial data input, analysis, and display. **PREREQS:** (GEO 301 or GEO 360) strongly recommended.

GEO 399 SPECIAL TOPICS (1-16)
This course is repeatable for a maximum of 16 credits.

GEO 399H SPECIAL TOPICS (1-16)
This course is repeatable for a maximum of 16 credits. **PREREQS:** Honors College approval required.

GEO 400 FIELD TRIPS (1-16)
Participation in group field trips that are not a part of any other course. Transportation fee is charged. Students may prepare guides for trips. Faculty sponsor must be prearranged. Graded P/N. This course is repeatable for a maximum of 16 credits. **PREREQS:** Departmental approval required.

GEO 401 RESEARCH (1-16)
Independent, original research subjects guided by faculty conferences and resulting in a brief written report. Faculty sponsor must be prearranged. This course is repeatable for a maximum of 16 credits. **PREREQS:** Departmental approval required.

GEO 403 THESIS (1-16)
Independent, original study that culminates in a senior thesis. Faculty sponsor must be prearranged. This course is repeatable for a maximum of 16 credits. **PREREQS:** Departmental approval required.

GEO 405 READING AND CONFERENCE (1-16)
Independent reading in specialized topics guided by and discussed in faculty conferences. Faculty sponsor must be prearranged. This course is repeatable for a maximum of 16 credits. **PREREQS:** Departmental approval required.

GEO 407 SEMINAR (1-16)
Graded P/N. This course is repeatable for a maximum of 16 credits. **PREREQS:** Departmental approval required.

GEO 408 WORKSHOP (1-16)
This course is repeatable for a maximum of 16 credits. **PREREQS:** Departmental approval required.

GEO 410 INTERNSHIP (1-15)
Pre-career professional experience under joint faculty and employer supervision. Graded P/N. This course is repeatable for a maximum of 16 credits. **PREREQS:** 12 credits of upper-division geosciences and departmental approval required.

GEO 420 GEOGRAPHY OF RESOURCE USE (3)
Functional concepts of resources, institutions affecting resource use, role of resources; resource supply, bases of controversy. Field trip(s) may be required; transportation fee charged. **PREREQS:** 9 credits of upper-division

geography.

GEO 423 LAND USE IN THE AMERICAN WEST (3)
Development of a conceptual framework for land use study; analysis of land as a resource, land use trends, land use principles, and management issues as related to planning, focusing on the American West, the fastest growing region in the nation.

GEO 424 INTERNATIONAL WATER RESOURCES MANAGEMENT (3)
An investigation of the various approaches to water resources geography at the international level. Explores the interaction between water science and policy through issues of current "hydropolitics" and water resources development. Topics include water quality, dams and development, conflict and cooperation, climate change, and water institutions. Offered separately as GEO 424 and GEO 524. **PREREQS:** 9 credits of upper-division geography and any course dealing with the hydrologic cycle.

GEO 425 WATER RESOURCES MANAGEMENT IN THE UNITED STATES (3)
An investigation of the various approaches to water resources geography within the U.S. Explores the disciplines that address water resources management, their tools, and their limitations. Topics include engineering, law, economics, risk assessment, game theory, conflict resolution, and the fine arts. Offered separately as GEO 425 and GEO 525. **PREREQS:** 9 credits of upper-division geography and any course dealing with the hydrologic cycle.

GEO 426 DEVELOPMENT AND GLOBAL RESOURCES (3)
Examines resource development issues and strategies in the Global South. Issues and strategies from agriculture, forestry, fisheries, energy, wildlife management, mineral development, land use, and health are examined. Offered every other odd year in spring.

GEO 435 FIELD GEOGRAPHY OF OREGON (3)
Designed as a capstone experience for Earth Science and Geography majors. It will challenge students to apply assessment techniques to determine the orgins of the physical features of a landscape, then what impacts those features have on the area's human geography, and vice versa. Three weekend field trips required. **PREREQS:** GEO 296 or other field course strongly recommended; junior or senior standing. Restricted to Earth Science and Geography majors.

GEO 444 REMOTE SENSING (4)
Fundamentals of satellite remote sensing and image analysis. Topics include physical principles of remote sensing from the ultraviolet to the microwave, sensors and sensor technology, and environmental applications of remote sensing through image analysis. Lec/lab. **PREREQS:** GEO 301 is recommended.

GEO 445 COMPUTER-ASSISTED CARTOGRAPHY (3)
Concepts and techniques underlying the production of maps by computer. Practical experience with a variety of computer mapping packages. Lec/lab. **PREREQS:** GEO 360 and MTH 112

GEO 449 GEOGRAPHY OF FOOD AND AGRICULTURE (3)
Overview of food and agriculture in relation to production and consumption regions as a basis for distinguishing different types of food and agricultural systems. Local and global examination of the geographic aspects of breeding, location in agricultural systems, and adaptation in agro-ecosystems using field study, exploration of literature, and lecture. Lec/lab. (Bacc Core Course)

GEO 451 ENVIRONMENTAL SITE PLANNING (3)
The use of geographic concepts/techniques in land use and site planning; especially natural area inventory, classification and analysis. Findings-of-fact presentation and report writing. Two local field trips may be required; transportation fee charged. Offered alternate years.

GEO 452 PRINCIPLES AND PRACTICES OF RURAL AND RESOURCE PLANNING (3)
Principles, techniques, and current practices of land use planning for rural areas. Emphasis on resource issues, organization of data, policy development, and decision-making. Offered alternate years. **PREREQS:** GEO 423 or GEO 523

GEO 453 RESOURCE EVALUATION METHODS/EIS (3)

Methods of resource analysis for land use planning; resource rating systems; environmental impact assessment: laws, procedures, and methods. Field trip(s) may be required; transportation fee charged. Offered alternate years. **PREREQS:** GEO 452

GEO 465 GEOGRAPHIC INFORMATION SYSTEMS AND SCIENCE (4)
Introduces students to the theory and techniques of geospatial analysis within a GIS. Focuses on developing a foundation in geospatial reasoning skills. Building upon the introductory material presented in GEO 365, this course will guide students through the process of developing and carrying out geospatial analyses using various spatial data structures, techniques and models. It will culminate in the completion of a geospatial analysis project developed by the student. Lec/lab. **PREREQS:** GEO 365 and GEO 365 or instructor approval.

GEO 466 DIGITAL IMAGE PROCESSING (3)
Digital analysis of remote sensor data. Image display enhancement, classification, and rectification principles. Practical experience with an image processing system. Offered alternate years. Lec/lab. **PREREQS:** GEO 444

GEO 480 ADVANCED GIS APPLICATIONS IN THE GEOSCIENCES (4)
Explores the concepts and uses of geographic information systems (GIS) for spatial analysis. Structured as an applications-based course where students learn how to acquire, clean, integrate, manipulate, visualize and analyze geospatial data through laboratory work. Lec/lab. **PREREQS:** GEO 465 and GEO 465 or GEO 565 or equivalent

GEO 483 SNOW HYDROLOGY (3)
Fundamentals of snow hydrology. Physical principles of snow formation, snowpack accumulation, energy balance, snowcover-climate interactions, snow metamorphism, snowpack ablation, snowpack/snowmelt chemistry, remote sensing of snow, avalanches, field methods, snowmelt/runoff modeling techniques, and watershed processes. **PREREQS:** GEO 202 and MTH 111

GEO 490 CONTEMPORARY EARTH SCIENCE ISSUES (3)
In-depth examination of selected significant issues in the geosciences. Topics vary. Emphasis on problem solving and collaborative research. **PREREQS:** Senior standing in Geology, Geography, Earth Sciences, or Environmental Sciences.

GEO 499 SPECIAL TOPICS (0-16)
This course is repeatable for a maximum of 16 credits.

GEO 500 FIELD TRIPS (1-16)
Participation in group field trips that are not a part of any other course. Transportation fee is charged. Students may prepare guides for trips. Faculty sponsor must be prearranged. Graded P/N. This course is repeatable for a maximum of 16 credits. **PREREQS:** Departmental approval required.

GEO 501 RESEARCH (1-16)
Independent, original research subjects guided by faculty conferences and resulting in a brief written report. Faculty sponsor must be prearranged. This course is repeatable for a maximum of 16 credits. **PREREQS:** Departmental approval required.

GEO 503 THESIS (1-16)
Independent, original study that culminates in a senior thesis. Faculty sponsor must be prearranged. This course is repeatable for a maximum of 999 credits. **PREREQS:** Departmental approval required.

GEO 507 SEMINAR (1-16)
This course is repeatable for a maximum of 16 credits. **PREREQS:** Departmental approval required.

GEO 508 WORKSHOP (1-16)
This course is repeatable for a maximum of 16 credits. **PREREQS:** Departmental approval required.

GEO 510 INTERNSHIP (1-15)
Pre-career professional experience under joint faculty and employer supervision. May not be used to meet minimum credit hour requirements for graduate degrees in geosciences. Graded P/N. This course is repeatable for a

maximum of 16 credits. **PREREQS:** 12 credits of upper-division geosciences.

GEO 515 HISTORY AND PHILOSOPHY OF GEOGRAPHY (3)
The historical development of research traditions in the discipline of geography. This includes an examination of changes in conceptual structures and current trends. **PREREQS:** Graduate standing in geography.

GEO 520 GEOGRAPHY OF RESOURCE USE (3)
Functional concepts of resources, institutions affecting resource use, role of resources; resource supply, bases of controversy. Field trip(s) may be required; transportation fee charged. **PREREQS:** 9 credits of upper-division geography.

GEO 523 LAND USE IN THE AMERICAN WEST (3)
Development of a conceptual framework for land use study; analysis of land as a resource, land use trends, land use principles, and management issues as related to planning, focusing on the American West, the fastest growing region in the nation.

GEO 524 INTERNATIONAL WATER RESOURCES MANAGEMENT (3)
An investigation of the various approaches to water resources geography at the international level. Explores the interaction between water science and policy through issues of current "hydropolitics" and water resources development. Topics include water quality, dams and development, conflict and cooperation, climate change, and water institutions. Offered separately as GEO 424 and GEO 524. **PREREQS:** 9 credits of upper-division geography and any course dealing with the hydrologic cycle.

GEO 525 WATER RESOURCES MANAGEMENT IN THE UNITED STATES (3)
An investigation of the various approaches to water resources geography within the U.S. Explores the disciplines that address water resources management, their tools, and their limitations. Topics include engineering, law, economics, risk assessment, game theory, conflict resolution, and the fine arts. Offered separately as GEO 425 and GEO 525. **PREREQS:** 9 credits of upper-division geography.

GEO 526 GLOBAL RESOURCES AND DEVELOPMENT (3)
Examines resource development issues and strategies in the Global South. Issues and strategies from agriculture, forestry, fisheries, energy, wildlife management, mineral development, land use, and health are examined. Offered every other odd year in spring.

GEO 534 FIELD GEOGRAPHY OF OREGON (3)
Designed to introduce students to the widest possible range of topics on all aspects of Oregon geography within a limited time, then turn that experience into a viable research proposal. While physical processes are the primary topic, resource and environmental effects are stressed.

GEO 541 SPATIO-TEMPORAL VARIATION IN ECOLOGY AND EARTH SCIENCE (4)
Objectives and techniques of spatial and temporal analysis. Point patterns, geostatistics, spectral analysis, wavelet analysis, interpolation, and mapping. Lec/lab. **PREREQS:** ST 411 or ST 511

GEO 544 REMOTE SENSING (4)
Fundamentals of satellite remote sensing and image analysis. Topics include physical principles of remote sensing from the ultraviolet to the microwave, sensors and sensor technology, and environmental applications of remote sensing through image analysis. **PREREQS:** GEO 301 is recommended.

GEO 545 COMPUTER-ASSISTED CARTOGRAPHY (3)
Concepts and techniques underlying the production of maps by computer. Practical experience with a variety of computer mapping packages. Lec/lab. **PREREQS:** GEO 360 and MTH 112

GEO 546 ADVANCED LANDSCAPE AND SEASCAPE ECOLOGY (4)
Pattern-process interactions in large scale ecological and physical systems, including terrestrial, aquatic, and marine/ocean ecosystems. Principles of pattern-process interactions from genetic to community levels of ecological organization applied to design of conservation reserves. Hypothesis testing, field techniques, spatial

models/statistics, GIS/remote sensing. Lec/lab.

GEO 548 FIELD RESEARCH IN GEOMORPHOLOGY AND LANDSCAPE ECOLOGY (3)
Natural history interpretation of disturbance and recovery processes and management implications in forest-stream landscapes of western Oregon. Course consists of field experience and several seminars. Transportation and lodging fee charged. **PREREQS:** 9 graduate credits of sciences or engineering.

GEO 549 GEOGRAPHY OF FOOD AND AGRICULTURE (3)
Overview of food and agriculture in relation to production and consumption regions as a basis for distinguishing different types of food and agricultural systems. Local and global examination of the geographic aspects of breeding, location in agricultural systems, and adaptation in agro-ecosystems using field study, exploration of literature, and lecture. Lec/lab.

GEO 551 ENVIRONMENTAL SITE PLANNING (3)
The use of geographic concepts/techniques in land use and site planning; especially natural area inventory, classification and analysis. Findings-of-fact presentation and report writing. Two local field trips may be required; transportation fee charged. Offered alternate years.

GEO 552 PRINCIPLES AND PRACTICES OF RURAL AND RESOURCE PLANNING (3)
Principles, techniques, and current practices of land use planning for rural areas. Emphasis on resource issues, organization of data, policy development, and decision-making. Offered alternate years. **PREREQS:** GEO 423 or GEO 523

GEO 553 RESOURCE EVALUATION METHODS/EIS (3)
Methods of resource analysis for land use planning; resource rating systems; environmental impact assessment: laws, procedures, and methods. Field trip(s) may be required; transportation fee charged. Offered alternate years. **PREREQS:** GEO 452

GEO 565 GEOGRAPHIC INFORMATION SYSTEMS AND SCIENCE (4)
Introduction to modern spatial data processing, development, and functions of geographic information systems (GIS); theory, concepts and applications of geographic information science (GISci). Lec/lab.

GEO 566 DIGITAL IMAGE PROCESSING (3)
Digital analysis of remote sensor data. Image display enhancement, classification, and rectification principles. Practical experience with an image processing system. Offered alternate years. Lec/lab. **PREREQS:** GEO 544

GEO 567 RESPONSIBLE GIS PRACTICE: ETHICS FOR FUTURE GEOSPATIAL PROS (3)
Prepares current and aspiring professionals to recognize, analyze and address ethical issues in geographic information science and technology. **PREREQS:** Instructor approval required.

GEO 568 INTERACTIVE CARTOGRAPHY AND GEOVISUALIZATION (4)
An overview of methods and applications in interactive, dynamic cartographic visualization, including the skills of designing, building, and evaluating customized user-interfaces to geographic information. Introduces students to a working knowledge of web programming to create interactive mapping applications, focusing on client-side technology. **PREREQS:** Basic programming experience (any language) and one GIS course; or instructor approval required.

GEO 577 ALGORITHMS FOR GEOGRAPHIC INFORMATION SCIENCE (4)
Introduction to algorithms and data models for the manipulation and visualization of geospatial data. Students are introduced to object-oriented programming using the Java programming language. **PREREQS:** GEO 545 and GEO 565 and GEO 578 and /or equivalent courses and programming experience.

GEO 578 GIS PROGRAMMING FOR GEOSPATIAL ANALYSIS (4)
Introduction to the extension of geographic information systems (GIS) through programming. This course teaches students to design and write programs to automate geospatial analysis. No prior programming experience is expected. **PREREQS:** GEO 565 and /or equivalent experience in GIS.

GEO 580 ADVANCED GIS APPLICATIONS IN THE GEOSCIENCES (4)

Explores the concepts and uses of geographic information systems (GIS) for spatial analysis. Structured as an applications-based course where students learn how to acquire, clean, integrate, manipulate, visualize and analyze geospatial data through laboratory work. Lec/lab. **PREREQS:** GEO 565 and GEO 465 or GEO 565 or equivalent

GEO 583 SNOW HYDROLOGY (3)
Fundamentals of snow hydrology. Physical principles of snow formation, snowpack accumulation, energy balance, snowcover-climate interactions, snow metamorphism, snowpack ablation, snowpack/snowmelt chemistry, remote sensing of snow, avalanches, field methods, snowmelt/runoff modeling techniques, and watershed processes.

GEO 584 ADVANCED SPATIAL STATISTICS AND GISCIENCE (2)
Provides advanced graduate students from a variety of disciplines in earth science and ecology the opportunity to structure and conduct spatio-temporal analyses using available software tools and their own datasets for their graduate research. Lec/lab.

GEO 599 SPECIAL TOPICS (0-16)
This course is repeatable for a maximum of 16 credits.

GEO 600 FIELD TRIPS (1-16)
Participation in group field trips that are not part of any other course. Transportation fee charged. Students may prepare guide for trips. Faculty sponsors must be arranged. Graded P/N. This course is repeatable for a maximum of 16 credits.

GEO 601 RESEARCH (1-16)
This course is repeatable for a maximum of 16 credits.

GEO 603 THESIS (1-16)
This course is repeatable for a maximum of 999 credits.

GEO 605 READING AND CONFERENCE (1-16)
This course is repeatable for a maximum of 16 credits.

GEO 606 PROJECTS (1-16)
This course is repeatable for a maximum of 16 credits.

GEO 607 SEMINAR (1-16)
Graded P/N. This course is repeatable for a maximum of 16 credits.

GEO 608 WORKSHOP (1-16)
This course is repeatable for a maximum of 16 credits.

GEO 699 SPECIAL TOPICS (1-16)
This course is repeatable for a maximum of 16 credits.