GRADUATE CERTIFICATE PROGRAM

GEOGRAPHIC INFORMATION SCIENCES

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Introduction

Geographic Information Sciences (GIScience) study geospatial phenomena using an integrated set of spatial digital technologies including tools, techniques, concepts, and data sets associated with geographic information systems, remote sensing, data visualization, global positioning systems, spatial analysis, and quantitative methods. Together, and separately, these geospatial theories and spatial digital technologies have gained prominence in geography and are emerging into associated social, behavioral, and biophysical sciences, as well as into city and regional planning, population-environment interactions, industry, government, health sciences, and health care delivery systems. GIScience offers the opportunity to gain fresh insights into the spatio-temporal patterns of variables and the behaviors of both social and ecological systems through, for example, (1) remotely sensed data that are capable of mapping a host of social and ecological landscapes using information from spatial, temporal, spectral, and directional domains, (2) the analytical and data integration capability of geographic information systems, (3) the locational specificity afforded through global positioning systems, (4) the predictive power of quantitative models and the descriptive capacity of statistical relationships and spatial analyses, and (5) the importance of data visualizations to characterize pattern and to relate scales of representation to processes influencing areal distributions recorded over space and through time. Due to the rapid growth of these spatial digital technologies, GIScience uses a suite of tools to support many kinds of decision-making and analyses with spatial data from multiple dimensions, such as environmental policy, marketing, planning, demographic analysis, as well as studies using integrated data within a GIS for resource management, ecological analyses, health care delivery, nutrition and diet, environment and health, epidemiology, information technology, and more. GIScience is routinely used in government agencies, corporations, environmental health and ecological consulting firms, planning organizations, and academic institutions.

Program Overview

The Graduate Certificate Program in *Geographic Information Sciences* offered within the Department of Geography is designed to educate and train students in geographic information systems, remote sensing, quantitative methods, spatial analysis, global positioning systems, and data visualization. The Program is intended to provide a mix of theory and practical knowledge having wide application in business, health, environment, planning, and in other areas. The Program is designed to serve (1) students in the arts and sciences as well as the health sciences and information technologies who wish to acquire cutting edge geospatial technical expertise to support the topical knowledge gained in their undergraduate and graduate programs, and (2) returning students who wish to acquire specialized education and training to meet current or future job requirements calling for knowledge in geographic information sciences. The primary goal of the Program is to ensure that students become sufficiently grounded in theoretical underpinnings of Geographic Information Sciences to enable them to make informed use of existing applications software and to construct new applications of moderate size in both the physical and social sciences. Through lab exercises and course projects, students will be acquired experiences using major GIScience software packages including ArcGIS, ENVI/IDL, R/S-Plus, GRASS, MatLab, QGIS, and more. By teaching concepts, spatial reasoning, and hands-on uses, the Program differs from a typical short course designed to teach a particular

software package and a relatively narrow range of spatial concepts germane to the software. The basic intent is for students to achieve a balanced combination of education and training in the use of a diverse set of tools, techniques, data, and spatial concepts that collectively reside within the analytical framework that defines Geographic Information Sciences.

Program Requirements

The Program requires 18-hours of graduate-level university credit to obtain a Certificate in Geographic Information Sciences from the University of North Carolina – Chapel Hill and the Department of Geography. These 18-credit hours are made up of two sets of courses: (1) a set of three core courses (select from the approved list below; substitutions considered) in Geographic Information Sciences required of all students enrolled in the Program, (2) a set of three elective courses in Geographic Information Sciences in Geography and other departments on campus that permit exploration of advanced or associated topics.No grade below "P" is accepted. The approved list of courses are in the following:

Geography Core Courses (choose three courses)
Geog 446– Geography of Health Care Delivery
Geog 477 – Introduction to Remote Sensing of the Environment
Geog 491 – Geographic Information Systems
Geog 541 – GIS in Public Health
Geog 577 – Advanced Remote Sensing
Geog 591 – Applied Issues in Geographic Information Systems
Geog 592 – GIS Programming
Geog 594 – Global Positioning Systems and Applications

Geography Elective Courses (choose at least one course)
Geog 410 – Modeling Environmental Systems
Geog 419 – Field Methods in Physical Geography
Geog 440 – Earth Surface Process
Geog 477 – Introduction to Remote Sensing of the Environment
Geog 491 – Geographic Information Systems
Geog 541 – GIS in Public Health
Geog 577 – Advanced Remote Sensing
Geog 591 – Applied Issues in Geographic Information Systems
              (Urban GIS **AND/OR** Watershed GIS)
Geog 592 – GIS Programming
Geog 594 – Global Positioning Systems and Applications
Geog 597 – Ecological Modeling
Geog 705 – Advanced Quantitative Methods in Geography
Geog 715 – Land Use/Land Cover Dynamics and Human-Environment Interactions
Geog 790 – Spatial Analysis and Computer Modeling
Geog 802 – Seminar in Geographic Information Sciences
Geog 812 –Readings in Geographic Information Sciences

Other Elective Courses (choose up to two courses)

Anthropology
419 – Anthropological Applications and GIS

Biology
463 – Field Ecology
464 – Global Change Ecology
465 – Global Biodiversity and Macroecology
561 -- Ecological Plant Geography
662 – Field Plant Geography

Biostatistics
600 – Principles of Statistical Inference
667 – Applied Stochastic Processes
668 – Design of Public Health Studies
670 – Demographic Techniques I
735 – Statistical Computing: Basic Principles and Applications
759 – Applied Time-Series Analysis
760 – Advanced Probability and Statistical Inference I
762 – Advanced Linear Models
771 – Demographic Techniques II

City & Regional Planning
491 – GIS for Planners
547 – Energy, Transportation, and Land Use
714 – Urban Spatial Structure
721 – Advanced Planning Methods
741 – Land Use and Environmental Planning
781 – Water Resources Planning and Policy Analysis

Computer Science
426 –Modern Web Programming
431 – Internet Services and Protocols
521 – Files and Databases
665 – Images, Graphics, and Vision
715 – Visualization in the Sciences
721 – Database Management Systems
775 – Image Processing and Analysis

Environmental Sciences & Engineering
453 – Ground Hydrology
468 – Advanced Functions of Temporal GIS
475 – Global Climate Change: Interdisciplinary Perspectives
570 -- Methods of Environmental Decision Analysis
600 – Environmental Health

661 – Scientific Computation I
668 – Methods of Applied Mathematics I
755 – Analysis of Water Resource Systems

Geological Sciences
415 – Environmental Systems Modeling
480 – Modeling of Marine and Earth Systems
483 – Geological and Oceanographic Applications of GIS
508 – Applied Hydrology
514 – River systems of the East Coast North Carolina
520 – Data Analysis in the Earth Sciences

Information & Library Science
520 – Organization of Information
523 – Introduction to Databases
541 – Information Visualization
572 – Web Development (1.5 Credits)
573 – Mobil Web Development (1.5 Credits)
582 – Systems Analysis
623 – Database Systems II
626 – Introduction to Big Data and NoSQL (1.5 Credits)
672 – Web Development II
723 –Database Systems III: Advanced Databases. 3 Credits.
760 – Web Databases

Marine Sciences
410 – Earth Processes in Environmental Systems
415 – Environmental Systems Modeling
432 – Major Rivers and Global Change: Mountains to the Sea
433 – Wetland Hydrology
483 – Geological & Oceanographic Applications of GIS
561 – Time Series & Spatial Data Analysis

Mathematics
550 – Topology
551 – Euclidean and Non-Euclidean Geometries
555 – Introduction to Dynamics

Sociology
708 –Statistics for Sociologists
711 – Analysis of Categorical Data
718 – Longitudinal and Multilevel Data Analysis

Statistics
754 – Time Series & Multivariate Analysis
734 – Stochastic Processes

757 – Bayesian Statistics
833 – Time-Series Analysis
856 – Multivariate Analysis
857 – Non-Parametric Multivariate Analysis

Admission to the Program

Admission is competitive. The minimum requirements are a bachelor's degree in any of the physical or social sciences or the humanities, and an introductory course in statistical methods (univariate statistics through bivariate correlation and regression). Application deadlines are June 15th for fall admission, and November 15th for spring admission. There are no summer admissions. Students pay fees according to the graduate tuition rates. See the Office of the Registrar for current tuition rates. Loans, student hourly positions, and similar financial aid administered through the University may be available. Certificate students (i.e., externally-admitted students for the Certificate Program; students not admitted into normal Graduate Programs in Geography or elsewhere on campus) are not eligible for teaching assistantships in Geography or
Graduate School Fellowships (University regulations), but students can apply for research assistantships associated with externally-funded projects and other department activities. The Program is intended as a 2-semester (full-time) course of study. Part-time students have up to 4-years to complete the Program. Party-time students automatically drop out of the program after enrolling into the program for 4 years without graduation. Reapplication for admission is needed if one wished to continue on the Program. On-campus graduate students can enroll in the Certificate Program throughout the academic year by contacting the Director of the GISc Graduate Certificate Program in the Department of Geography. Up to 6-credit hours graduate level courses may transfer to meet Program requirements. Given the rapid development in the field of geographic information sciences, courses taken more than 5 years ago will not be accepted into the program to fulfill the credit requirement. The Program Director will review applications for admission, consulting with the Coordinating Committee and considering other program elements as needed (e.g., course and credit transfer). Upon completion of the Program, a Certificate of Accomplishment will be awarded by the Department of Geography and a "Certificate" notation will be added to the transcript by the UNC Office of the Registrar, thereby, indicating a satisfactory completion of the Program.

The current graduate students at UNC Chapel Hill can be admitted to the Certificate Program as long as he/she meets the minimum requirement with approval from his/her advisor, the prospective graduate student should contact the Program director for admission with a cover letter as. However, not all the relevant graduate courses can be counted toward the credit requirement for the program. A maximum of 40% of the certificate credit hours can overlap with an existing graduate program. No grade below "P" for UNC graduate students will be accepted in the Program.

Application Material

To apply, please send an undergraduate and/or graduate transcript(s), two letters of recommendation (directly sent to the program director), and an essay that describes your interest in the program and your rationale for applying. Indicate your requested start date (i.e.,

fall or spring semester), course listings and descriptions of any possible transfer credit requested, and full contact information. While research assistantship funding by the department should not be expected, your application may indicate your possible interest in an assistantship or other department activities with suitable justification.

Contact Information

Students should enroll in the GISc Certificate Program within the Department of Geography by completing the required application material (see above) and sending it electronically or in hardcopy to:

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