



ADVANCED (GRADUATE)

CERTIFICATE

CONCENTRATION IN

GEOGRAPHIC INFORMATION SCIENCE

CERTIFICATE PROGRAM

INFORMATION

DEPARTMENT OF GEOGRAPHY
NATIONAL CENTER FOR GEOGRAPHIC INFORMATION AND ANALYSIS

Certificate Concentration Description

I. Overview

The University at Buffalo offers doctoral degree students in selected departments the opportunity to earn an Advanced (Graduate) Certificate in Geographic Information Science (GIScience). GIScience is a fast-growing, multidisciplinary field, and the goal of the University at Buffalo's concentration is to prepare Ph.D.s with the intellectual backgrounds, and the technical, professional, and personal skills necessary for a successful and rewarding career. The certificate concentration is housed in the University's Department of Geography, and is administered by its National Center for Geographic Information and Analysis.

To earn a certificate in GIScience, students complete all the requirements for a doctoral degree from one of eight discipline-based departments. The eight departments are: *Anthropology, Civil, Structural, and Environmental Engineering, Computer Science and Engineering, Geography, Geology, Industrial Engineering, Philosophy, and Political Science*. GIScience certificate students also complete a core of four required GIScience courses and one GIScience elective course. Students also show technical competence in Geographic Information Systems applications, and complete and defend a dissertation on a topic related to geographic information science selected in consultation with their advisory committee.

II. ADMISSION

Early applications are strongly encouraged, and **all applications must be made no later than the twelve months before the end of the student's doctoral studies.**

To apply for admission to the GIScience Certificate Concentration, a student must:

- Submit an application to the doctoral program of one of the participating home departments, following all regulations and procedures established by the home department **OR** be enrolled as a doctoral student in good standing in one of the participating departments (*to contact the home department, see page 6*).
- Submit an online application to the GIScience concentration, which includes an essay describing his/her interest in GIScience. (*for application visit our website at www.geog.buffalo.edu/certificate to apply*).

Certificate Concentration Requirements

To qualify for an Advanced (Graduate) Certificate in Geographic Information Science, a student must:

- Be admitted to one of the departmentally-based participating Doctoral programs; maintain status as a full-time graduate student in good standing in the home department; and successfully complete all doctoral degree requirements of the home department.
- Register the intent to pursue the GIScience Certificate concentration with the GIScience Steering Committee no later than the twelve months before the end of their doctoral studies.
- Conform to all other regulations and requirements of their home department, the GIScience Certificate concentration, and the Graduate School of the University at Buffalo.
- Take the four required GIScience core courses, and one GIScience elective course approved by student's advisor and IGERT program director. This course may also count toward the degree requirements of the home department.
- Demonstrate competence in the use of Geographic Information Systems through (a) successful completion of an appropriate course (e.g. GEO 506); or (b) demonstration that they have successfully completed a course covering comparable topics within the past three years; or (c) provision of current proof of certification as a GIS specialist.
- Select a Ph.D. advisory committee chaired by a member of the UB GIScience faculty roster, and including at least one other GIScience faculty member from outside the student's home academic department at UB.
- Write and defend a dissertation proposal, and complete and defend a dissertation on a topic related to geographic information science selected in consultation with the student's advisory committee.

GIScience Certificate students will be encouraged to participate in the GIScience colloquium series, and in faculty-led GIScience research projects on campus. Students are also encouraged to spend at least one summer or semester in an internship in a non-academic research environment. Students are also encouraged to undertake an international experience, by attending classes or seminars overseas or by participating in an international research internship.

Concentration Elements

I Education

GIScience students take a core of four required courses and one elective approved by the student's advisor and Program Director. Students also demonstrate competence in the use of GIS, either by transcript or by taking an appropriate course or training program. Credit hours appear in parenthesis after each course name.

*Check with departments or instructors regarding prerequisites for these courses.
Courses listed may not necessarily be offered every academic year.*

Required [Core] Courses

GEO 591 Introduction to Geographic Information Science (3)
CSE 562 Database Systems (3)
OR GEO 595 Database Design for GIS (3)
PHI 531 Problems in Ontology: Ontological Foundations of Geographic Information Science (3)
PHI 640 Graduate Research Ethics (3)
One elective, min 3 credits, related to GIScience and approved by the student's advisor and the IGERT Program Director.

II. Research Areas

Program students will be able to participate in active research programs. Short descriptions of the areas and examples of current projects are given below:

Cognitive Models of Geographic Space

Knowledge about how people think about geographic phenomena and about their kinds, relations, and distributions is fundamental to many human activities. Geographic databases are built so that people can use them, and their utility depends on their content making sense to their users. Two tasks can be distinguished: the construction of databases and associated software, and the understanding of how the users conceptualize the phenomena represented. The performance of these tasks must be grounded in sound cognitive principles. Ongoing research efforts in this area at the University at Buffalo include projects on the formal models of spatial relations; ontological investigations of land and property; investigations in the ontology of boundaries, the ontology of geographic categories, and formal-ontological foundations of ecology.

Geographic Information and Society

The possession of information, and the ownership or control of the means to produce, distribute, and consume it, have become significant sources of power in human society. The widespread development and adoption of geographic information technologies are occurring concurrently with the explosion of Internet and WWW access, enabling public participation in decision-making and, simultaneously, greater surveillance and control. Debates concerning geographic information mirror broader debates about information in general, particularly in areas such as ownership of and access to data, and invasion of privacy. Ongoing research projects at Buffalo include research into Public-Participation GIS; the critical history of GIS; nature and society conflicts in suburban environments; and the redefining or remapping of community and place in the information age.

Computational Implementations of Geographic Concepts

Researchers at Buffalo are establishing formalizations of geographic concepts that will allow the development of algorithms and data structures that behave consistently in computational environments. Some specific projects include research on the ontology of fields; interoperable systems for environmental modeling, geographical data management and retrieval systems; accuracy of linearly referenced transportation data; and computational identification of clusters of points.

Environmental Modeling

Research in environmental modeling at Buffalo includes studies of environmental processes, environmental quality, and environmental policy. Since environmental phenomena are spatially distributed and temporally dynamic, the integration of environmental modeling and GIS provides an important instrument for advancing both basic and applied research. Research toward integrating environmental modeling and GIS has taken two directions: the development of more effective GISs that can support the generic demands of environmental modeling and the adaptation of GISs to facilitate the many data management, analysis, and visualization tasks required by environmental modeling.

Regional Modeling and Optimization

Current projects in this area at Buffalo include the development of improved methods to model the choice among spatially-referenced alternatives, and the design of spatial decision support systems for land use planning and for hazardous materials routing. Another research focus is on the development of spatial statistics designed to detect and to monitor the evolution of clusters. Cluster identification is an important tool in environmental health, epidemiology, crime analysis, and in many other ecological and social contexts. Other researchers are working on integrating GIS technology to improve the estimation of police response time and travel times to help determine the optimal design of reporting districts in a police department.

Human Capital Research Using GIS

Spatially differentiated social, economic, and political processes obviously affect the intensity of human capital development within societies. Geographic information science and geographic analysis, incorporating theoretical and statistical techniques to address the geographic dimension of human capital research, promise to advance our understanding of a variety of questions and issues identified under the major areas of human capital research, namely: employing a productive workforce, educating for the future; fostering successful families; building strong neighborhoods; reducing disadvantage in a diverse society; and overcoming poverty and deprivation. Examples of related research projects at Buffalo include research into the impact of block clubs on neighborhood safety and stability; research into the evolving pattern of racial segregation in cities; and several projects on policing and crime, including community-oriented policing services, and the development of GIS based crime analysis applications.

GIScience Faculty in Participating Departments

Joseph Atkinson, Civil, Structural & Environmental Engineering

Sharmistha Bagchi-Sen, Geography

Rajan Batta, Industrial Engineering

Matthew Becker, Geology

Ling Bian, Geography

Ann Bisantz, Industrial Engineering

Jason Briner, Geology

Marcus Bursik, Geology

Irene Casas, Geology

Jan Chomicki, Computer Science & Engineering

Randall Dipert, Philosophy

D. Munroe Eagles, Political Science

Charles Frake, Department of Anthropology

Venu Govindaraju, Computer Science & Engineering

Igor Jankovic, Civil, Structural & Environmental

Chris Larsen, Geography

James Llinas, Industrial Engineering

D. Scott Mackay, Geography

David Mark (Program Director), Geography

Sarunas Milisauskas, Anthropology

Jessie Poon, Geography

Alan Rabideau, Civil, Structural & Environmental Engineering

Chris Renschler, Geography

Peter Rogerson, Geography

Stuart Shapiro, Computer Science & Engineering

Narushige Shiode, Geography

Barry Smith, Philosophy

Aidong Zhang, Computer Science & Engineering

Ezra Zubrow, Anthropology

Participating Academic Departments

Department of Anthropology

University at Buffalo
369 Fillmore, Ellicott Complex
Buffalo, NY 14261
Phone: (716) 645-2414 Fax: (716) 645-3808
Apply: wings.buffalo.edu/anthropology/programs.html
Web: wings.buffalo.edu/anthropology/
Graduate Admissions Secretary:
Margaret Kasprzyk, (716) 645-2414
Email: mmk22@buffalo.edu

Civil, Structural & Environmental Engineering

University at Buffalo, 202 Jarvis Hall
Buffalo, NY 14260
Phone: (716) 645-2114 Fax: (716) 645-3733
Apply: <http://www.civil.buffalo.edu/Graduate/forms.html>
Web: <http://www.civil.buffalo.edu/>
Graduate Admissions Secretary:
Kirsten Brown, (716) 645-2114, ext. 2333
Email: kabrown@eng.buffalo.edu

Department of Geology

University at Buffalo
876 Natural Sciences Complex
Buffalo, NY 14260
Phone: (716) 645-6800 Fax: (716) 645-3999
Web: www.geology.buffalo.edu
Graduate Admissions Secretary:
Marty Roth, (716) 645-6800 x6100
Email: mlroth@buffalo.edu

Department of Industrial Engineering

University at Buffalo
301 Bell Hall
Buffalo, NY 14260
Phone: (716) 645-2537 Fax: (716) 645-3302
Apply: www.eng.buffalo.edu/Departments/ie/Graduate/gradonline.html
Web: www.eng.buffalo.edu/Departments/ie/
Graduate Admissions Secretary:
Patricia Brock, (716) 645-2357, ext. 2102
Email: brock@eng.buffalo.edu

Dept. of Computer Science & Engineering

University at Buffalo, 226 Bell Hall
Buffalo, NY 14260
Phone: (716) 645-3180 Fax: (716) 645-3464
Apply: www.cse.buffalo.edu/grad/admission.html
Web: www.cse.buffalo.edu/
Graduate Admissions Secretary:
Yvette Pardee, (716) 645-3180, ext. 122
Email: cse-gradinfo@cse.buffalo.edu

Department of Geography

University at Buffalo
105 Wilkeson Quad, Ellicott Complex
Buffalo, NY 14261
Phone: (716) 645-2722 Fax: (716) 2329
Apply: www.geog.buffalo.edu
Web: www.geog.buffalo.edu
Graduate Admissions Secretary:
Betsy Abraham, (716) 645-2722, ext. 13
Email: babraham@buffalo.edu

Department of Philosophy

University at Buffalo
135 Park Hall
Buffalo, NY 14260
Phone: (716) 645-244 Fax: (716) 645-6139
Apply: wings.buffalo.edu/philosophy/department/grad_program/graduate1.html
Web: cas.buffalo.edu/philosophy/
Graduate Admissions Secretary:
Judy Wagner, (716) 645-2444, ext. 207
Email: jjwagner@acsu.buffalo.edu

Department of Political Science

University at Buffalo
518 Park Hall
Buffalo, NY 14260
Phone: (716) 645-2251
Apply: wings.buffalo.edu/soc-sci/pol-sci/Polsciapply.html
Web: wings.buffalo.edu/soc-sci/pol-sci/
Graduate Admissions Secretary:
Pam Rutenber, (716) 645-2251, ext. 520
Email: pr24@buffalo.edu

TO APPLY:

ONLINE APPLICATIONS ARE ENCOURAGED

WWW.GEOG.BUFFALO.EDU/CERTIFICATE

FOR ADDITIONAL INFORMATION REGARDING THIS PROGRAM:

UNIVERSITY AT BUFFALO

NCGIA

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Version IV 07/07