

LEHMAN COLLEGE  
OF THE  
CITY UNIVERSITY OF NEW YORK

DEPARTMENT OF EARTH, ENVIRONMENTAL AND GEOSPATIAL SCIENCES

CURRICULUM CHANGE

**1. Type of Change:** New Advanced Certificate Program (Expedited)\*

Hegis #: 2206.10

Related Program Code: 2206.00

**2. New Advanced Certificate Program:**

The Advanced Certificate in Geographic Information Science (GISc) consists of 17-20 credits of graduate-level coursework, and builds on the strengths of Lehman's Masters of Science Program in GISc (MS-GISc). This Certificate is designed to attract and prepare professionals in the New York City metropolitan region and beyond who work in the various fields involving spatial information, such as urban planning, environmental management, public health, engineering, and sustainable development, for new or augmented careers incorporating GISc. It is intended to give the students the opportunity to develop or upgrade their skills and knowledge of GISc especially as applied to their particular fields. The GISc Certificate Program courses also can be applied toward the MS-GISc graduate degree if the courses comply with the College's transfer of credit or change of degree policies.

The admission requirements for the Advanced GISc Certificate are:

- 1) a minimum of 3.0 GPA in previous coursework at the post-secondary level;
- 2) submission of all undergraduate and/or graduate transcripts;
- 3) submission of academic or professional letters of recommendation (two minimum);
- 4) a current CV; and
- 5) a personal essay or statement about your interest in GISc and the MS-GISc Program at Lehman College.

**Two Required Courses (8 Credits)**

GEP 605 Special Projects in GISc (4 credits)

GEP 690 Workshop in GISc Research (4 credits)

**9-12 Credits to be chosen from the following elective courses:**

GEP 504 Basic Mapping Science (3 credits)

GEP 505 Principles of GISc (3 credits)

GEP 602 Biogeography and GISc (4 credits)

GEP 606 Raster Analysis (3 credits)

GEP 610 Spatial Analysis of Urban Health (3 credits)

GEP 620 Demography and Population Geography with GIS (3 credits)

GEP 621 Principles and Applications in Remote Sensing (4 credits)

GEP 630 Geostatistics and Spatial Analytical Concepts (3 credits)

GEP 631 Advanced Remote Sensing (4 credits)

GEP 632 Environmental Health and GISc (3 credits)

GEP 635 Natural Hazards and Risk Analysis (4 credits)

GEP 640 Urban Geography and GISc (3 credits)

GEP 641 Digital Image Analysis (4 credits)

GEP 650 Topics in regional geography and applied mapping analysis (4 credits)

GEP 660 Analytical Cartography and Scientific Visualization (4 credits)

GEP 662 Programming for GISc (3 credits)

GEP 664 Spatial Database Management (3 credits)

GEP 675 Field Surveying, GPS, and Data Acquisition Methods (3 credits)

GEP 680 Emerging Issues and Methods in GISc (3 credits)

GEP 689 Methods Seminar in GISc (3 credits)

(Other courses may be substituted with department permission.)

**3. Rationale:**

The proposed 17-20-credit Advanced Certificate Program in GISc is intended to meet the educational needs or career objectives of several distinct groups of learners: professionals in the many fields utilizing spatial data, or those wishing to make a career change that requires GISc skills, as well as students who wish to augment their existing education by developing or upgrading their GISc skills in order to improve their career prospects.

**4. Date of Department Approval:**

January 24, 2013

\* Please see attached Expedited Application for Registration of a New Certificate or Advanced Certificate Program



## Expedited Application for Registration of a New Certificate or Advanced Certificate Program

This application is for New York degree-granting institutions seeking to register a new Certificate or Advanced Certificate program. Please download and save this file, enter the requested information, and submit to the State Education Department.

*Note that public institutions should use the appropriate SUNY/CUNY proposal submission forms in lieu of the attached forms and submit proposals to SUNY/CUNY Central Administration. The expedited review option is not available to programs intended to prepare candidates for teacher certification or professional licensure.*

Item	Response ( <i>type in the requested information</i> )
<b>Program type</b> <i>Check program type</i>	<input type="checkbox"/> Certificate <input checked="" type="checkbox"/> Advanced Certificate
<b>Institution name and address</b>	Lehman College 250 Bedford Park Blvd West Bronx, NY 10468  <i>Additional information:</i> <ul style="list-style-type: none"> <li>▪ Specify campus where program will be offered, if other than the main campus: Main Campus</li> <li>▪ If any <i>courses</i> will be offered off campus, indicate the location and number of courses and credits: NA</li> </ul>
<b>Program title, credits, and proposed HEGIS code</b>	Program title: Advanced Certificate in Geographic Information Science Credits: 17-20 Proposed HEGIS code: 2206.10
<b>Program format</b>	Check all program scheduling and format features that apply: (See definitions) i) <b>Format:</b> <input type="checkbox"/> Day <input checked="" type="checkbox"/> Evening <input type="checkbox"/> Weekend <input type="checkbox"/> Evening/Weekend <input checked="" type="checkbox"/> Not Full-Time ii) <b>Mode:</b> <input checked="" type="checkbox"/> Standard <input type="checkbox"/> Independent Study <input type="checkbox"/> External <input type="checkbox"/> Accelerated <input type="checkbox"/> Distance Education* iii) <b>Other:</b> <input type="checkbox"/> Bilingual <input type="checkbox"/> Language Other Than English  *If distance education, please also see <a href="http://www.highered.nysed.gov/ocue/ded/reviseddepplication.doc">http://www.highered.nysed.gov/ocue/ded/reviseddepplication.doc</a>
<b>Related degree program(s)</b>	Indicate the registered degree program(s) by title, award and five-digit SED code to which the credits will apply: Masters of Science in Geographic Information Science (MS-GISc). 40 credits; SED #35440
<b>Contact person for this proposal</b>	Name and title: Juliana Maantay, Professor Telephone: 718-960-8574 Fax: 718-960-8584 E-mail: Juliana.maantay@lehman.cuny.edu

<b>CEO (or designee) approval</b>	Name and title: Anny Morrobel-Sosa, Provost
	Signature and date:
	<b>Signature affirms the institution's commitment to support the proposed program.</b>
	<b>If the program will be registered jointly<sup>1</sup> with another institution, provide the following information:</b>
	Partner institution's name: NA
	Name and title of partner institution's CEO:
	Signature of partner institution's CEO:

**Please enter the requested information about the proposed program.** Answer rows will expand as needed when information is entered.

## 1. Program Description and Purpose

### a) Provide a brief description of the program as it will appear in the institution's catalog.

*Answer:*

#### **Advanced Certificate in Geographic Information Science (GISc) – 17-20 credits**

The Advanced Certificate in Geographic Information Science consists of 17-20 credits of coursework and builds on the strengths of Lehman's Masters of Science Program in GISc (MS-GISc). This Certificate is designed to attract and prepare professionals in the New York City metropolitan region and beyond who work in the various fields involving spatial information, such as urban planning, environmental management, public health, engineering, and sustainable development, for new or augmented careers incorporating GISc. It is intended to give the students the opportunity to develop or upgrade their skills and knowledge of GISc especially as applied to their particular fields. The GISc Certificate Program can also serve as an entry into the MS-GISc Program for students who maintain good standing throughout the certificate program. The Certificate Program credits will transfer into the MS-GISc Program if students are accepted through the formal application process.

#### **8 Credits in Required Courses**

GEP 605 Special Projects in GISc (4 credits)

GEP 690 Workshop in GISc Research (4 credits)

#### **9-12 Credits to be chosen from the following:**

GEP 504 Basic Mapping Science (3 credits)

GEP 505 Principles of GISc (3 credits)

GEP 602 Biogeography and GISc (4 credits)

GEP 606 Raster Analysis (3 credits)

GEP 610 Spatial Analysis of Urban Health (3 credits)

GEP 620 Demography and Population Geography with GIS (3 credits)

GEP 621 Principles and Applications in Remote Sensing (4 credits)

GEP 630 Geostatistics and Spatial Analytical Concepts (3 credits)

GEP 631 Advanced Remote Sensing (4 credits)

GEP 632 Environmental Health and GISc (3 credits)

GEP 635 Natural Hazards and Risk Analysis (4 credits)

GEP 640 Urban Geography and GISc (3 credits)

GEP 641 Digital Image Analysis (4 credits)

GEP 650 Topics in regional geography and applied mapping analysis (4 credits)

GEP 660 Analytical Cartography and Scientific Visualization (4 credits)

GEP 662 Programming for GISc (3 credits)

GEP 664 Spatial Database Management (3 credits)

GEP 675 Field Surveying, GPS, and Data Acquisition Methods (3 credits)

GEP 680 Emerging Issues and Methods in GISc (3 credits)

GEP 689 Methods Seminar in GISc (3 credits)

(Other courses may be substituted with department permission.)

<sup>1</sup> If the partner institution is non-degree-granting, see CEO Memo 94-04 at [www.highered.nysed.gov/ocue/ceo94-04.htm](http://www.highered.nysed.gov/ocue/ceo94-04.htm).

**b) List educational and (if appropriate) career objectives.**

*Answer:* The proposed program will meet the educational needs or career objectives of several distinct groups of learners: professionals in the many fields utilizing spatial data, or those wishing to make a career change that requires GISc skills, as well as students who wish to augment their existing education by developing or upgrading their GISc skills in order to improve their career prospects.

**How does the program relate to the institution's mission and/or master plan?**

*Answer:* Geographic Information Science has been at the forefront of the College's mission and vision plan for a number of years. The President's statement (<http://www.lehman.edu/president/mission.php>) specifically mentions GISc as an important component of the future of the College: "Lehman College will prepare students to live and work in the global community through new interdisciplinary programs. ....The College's geographic information systems and numerous partnerships ....will contribute to the economic development of the region." The implementation of a graduate certificate in GISc will further the fulfillment of this aim.

**d) Describe the role of faculty in the program's design.**

*Answer:* This program has been designed and developed by J. Maantay in consultation with EEGS Department Faculty listed in Table 2 of this form, and following discussions with the Dean of Natural and Social Sciences and the Director of the Graduate Studies Office at Lehman College. The EEGS Dept. faculty will contribute to the Certificate through curriculum design and updating, teaching the courses, and advising and mentoring the students. The faculty will meet to discuss the integration of courses and the needs of the Certificate students and appropriate mentorship for this group of students. The Certificate students will be invited to the MS-GISc students' seminars and presentations. The Certificate's faculty will provide an intellectual and collegial environment for these students.

**e) Describe the input by external partners, if any (e.g., employers and institutions offering further education).**

*Answer:* The MS-GISc Program has an Advisory Board comprised of GISc professionals from governmental agencies, non-profit organizations, private-sector industry, medical centers, and research institutions. This Board assists the faculty and students in the GISc Program by their involvement in curriculum development and recommendations, program assessment and evaluation, career advisement, and mentoring. This involvement is invaluable to the program, and will be expanded with the advent of the GISc Certificate Program.

**f) What are the anticipated Year 1 through Year 5 enrollments?**

*Answer:* We anticipate incoming cohorts of 6-10 students in the 1<sup>st</sup> through 5<sup>th</sup> year with the majority of students studying part time to complete the program within 2 years.

	Year 1	Year 2	Year 3	Year 4	Year 5
<b>Number of Incoming Students</b>	6	8	10	10	10
<b>Total Number of Students</b>	6	14	18	20	20

**2. Sample Program Schedule**

Complete the sample program schedule (**Table 1**) for the first full cycle of the program (e.g., two semesters for a traditional 24 credit-hour Certificate program).

- If the program will be offered through a nontraditional schedule, provide a brief explanation of the schedule, including its impact on financial aid eligibility. *Answer:* The proposed Certificate Program will be scheduled as part-time in evening in order to accommodate working professionals. Due to the nontraditional schedule of the program, students will not be eligible to receive TAP.
- For existing courses, submit a copy of the catalog description. Provide syllabi for all new courses. *Answer:* See pages 10-12 of this document for existing course descriptions. No new courses are proposed.

**3. Faculty**

- a) Complete the faculty tables** that describe full-time faculty (**Table 2**), part-time faculty (**Table 3**), and faculty to be hired (**Table 4**), as applicable. Faculty curricula vitae should be provided only on request.

- b) What is the institution's definition of "full-time" faculty?** *Answer:*

Program load is 21 hrs/academic year for tenured/tenure-track faculty, and 27 hrs/academic year for Lecturers.

#### 4. Financial Resources and Instructional Facilities

**Summarize** the instructional facilities and equipment committed to ensure the success of the program.

*Answer:*

Cost: \$1,000 per year for recruitment, advertising, and misc. expenses for the new program.

Additionally, we will need an adjunct to teach one specialty/professional skills course per year at a cost of approx. \$4,000

No additional/new full-time faculty or other personnel costs are anticipated.

No new laboratory or equipment is required.

No library costs are anticipated

Revenue: For a per credit rate (in-state graduate tuition) of \$365.00 with \$65 per additional contact hour, it is estimated that the proposed program will generate approximately **\$26,400.00** in tuition revenue in the first year and **\$53,500.00** in the second year, **\$68,400.00** in the third year, and about **\$74,500.00** in each following year.

Year 1: 6 students X 11 credits + 5 add'l contact hrs X \$365.00/credit + \$65/contact hr = **TOTAL Year 1 = \$26,400.00**

Year 2: 6 continuing students X 8 credits + 2 contact hr X \$365.00/credit + \$65/contact hr = \$18,300.00/year  
Plus 8 incoming students x 11 credits + 5 add'l contact hr x \$365.00/cr + \$65/contact hr = \$35,200.00

**TOTAL Year 2 = \$53,500.00**

Year 3: 10 incoming students x 11 credits + 5 add'l contact hrs = \$44,000.00; Plus 8 continuing students x 8 credits + 2 add'l contact hr x \$365.00/cr + \$65/contact hr = \$24,400.00; **TOTAL Year 3 = \$68,400.00**

Year 4 and subsequent years: 10 incoming students x 11 credits + 5 add'l contact hrs = \$44,000.00; Plus 10 continuing students x 8 credits + 2 add'l contact hrs x \$365.00/cr + \$65/contact hr = \$30,500.00; **TOTAL Year 4 and after = \$74,500.00**

**b) Complete the new resources table (Table 5).**

#### 5. Admissions

**a) List all *program* admission requirements** (or note if identical to the institution's admission requirements).

*Answer:* The admissions requirements are: the undergraduate and/or graduate transcripts; a minimum of 3.0 GPA; academic or professional letters of recommendation; a current CV; and a personal essay or statement.

**b) Describe the process for evaluating exceptions to those requirements.**

*Answer:* Exceptions to the above requirements may be made based upon evaluation of previous course work and experience.

**c) How will the institution encourage enrollment by persons from groups historically underrepresented in the discipline or occupation?**

*Answer:* One of Lehman College's missions is to encourage enrollment by historically under-represented individuals. Students from these under-represented groups will be actively recruited - We will have community outreach, brochures and mailers, advertisements in appropriate journals and trade magazines, liaison with professional groups, informational sessions about the program advertised locally, as well as visibility on our website, along with the creation of a Facebook page and a Twitter account.

#### 6. Academic Support Services

**Summarize the academic support services available** to help students succeed in the program.

*Answer:* Students will have access to faculty instructors and will be monitored and advised by the director of the GISc Program, J. Maantay. Certificate students will have access to the Library resources, writing labs, GISc teaching and research Labs, with relevant software available through CUNY license, as well as career services and advisement.

#### 7. Credit for Experience

**If this program will grant substantial credit for learning derived from experience, describe the methods of evaluating the learning and the maximum number of credits allowed.** *Answer:* NA

## 8. Program Assessment and Improvement

**Summarize the plan for periodic evaluation of the new program, including a timetable and the use of data to inform program improvement.**

*Answer:* All of the courses required by the proposed Advanced Certificate in GISc Program are also included in the existing MS-GISc Program for which there is an assessment and evaluation plan. The proposed Certificate Program will be incorporated into this assessment plan. Students complete an evaluation form at the end of each semester, and the data from the assessments are shared with instructors in the program and are used to revise course curriculum and teaching as necessary. The Advisory Board also contributes to assessment and evaluation.

## 9. Transfer Programs

If the program will be **promoted as preparing students for transfer to a program at another institution**, provide a copy of an articulation agreement with the institution

*Answer:* NA

---

**Table 1: Program Schedule**

- Indicate **academic calendar** type:   x  Semester   Quarter   Trimester   Other (describe)
- Label each term in sequence, consistent with the institution's academic calendar (e.g., Fall 1, Spring 1, Fall 2)
- Copy/expand the table as needed to show additional terms

Term: Fall 1				Term: Spring 1			
Course Number & Title	Credits	New	Prerequisite(s)	Course Number & Title	Credits	New	Prerequisite(s)
GEP 505 Principles of GISc	3			Geovisualization and Analytical Cartography	4		GEP 505 or equivalent
GEP 621 Remote Sensing	4						
Term credit total:	7			Term credit total:	4		
Term: Fall 2				Term: Spring 2			
Course Number & Title	Credits	New	Prerequisite(s)	Course Number & Title	Credits	New	Prerequisite(s)
GEP 605 Special Projects in GISc	4		GEP 505 or equivalent	GEP 690 Workshop in GISc Research	4		GEP 605 or permission
Term credit total:	4			Term credit total:	4		
Term:				Term:			
<b>Program Totals:</b>		<b>Credits: 17-20</b>					

**New:** indicate if new course    **Prerequisite(s):** list prerequisite(s) for the noted courses



**Table 2: Full-Time Faculty**

Faculty teaching at the graduate level must have an earned doctorate/terminal degree or demonstrate special competence in the field. Provide information on faculty members who are full-time at the institution and who will be teaching each course in the major field or graduate program. The application addendum for professional licensure, teacher certification, or educational leadership certification programs may provide additional directions for those types of proposals.

<b>Faculty Member Name and Title</b> (include and identify Program Director)	<b>Program Courses to be Taught</b>	<b>Percent Time to Program</b>	<b>Highest and Other Applicable Earned Degrees &amp; Disciplines</b> (include College/University)	<b>Additional Qualifications:</b> list related certifications/ licenses; occupational experience; scholarly contributions, etc.
Juliana Maantay Professor Program Director	GEP 605 Special Projects in GISc 4cr	75%	Ph.D. 2000, Urban Environmental Geography, Rutgers University, NJ; MUP 1992 Urban Planning, New York University NY	Director of the Master of Science in Geographic Information Science Program; 20 yrs experience in urban and environmental planning and policy with GISc; Fulbright Distinguished Chair; author of a top 10 GISc textbook
	GEP 690 Workshop in GISc Research 4cr			
	GEP 610 Spatial Analysis of Urban Health 3cr			
	Other electives			
Yuri Gorokhovich Assistant Professor	GEP 635 Natural Hazards 4cr	25%	Ph.D. 1999, Earth and Environmental Sciences, City University of New York	
	GEP 675 Data Acquisition 3cr			
Elia Machado Assistant Professor	GEP 621 Remote Sensing 4cr	40%	Ph.D. 2011, Geography, Clark University, MA	
	GEP 504 Basic Mapping Science 3cr			
	GEP 606 Raster Analysis 3cr			
	Other electives			
Andrew Maroko Assistant Professor	GEP 632 Environmental Health and GISc 3cr	40%	Ph.D. 2009, Earth and Environmental Sciences, City University of New York	
	GEP 505 Principles of GISc 3cr			
	GEP 640 Urban Geography and GISc 3cr			
	Other electives			
Glen Johnson Associate Professor	GEP 630 Geostatistics and Spatial Analytical Concepts 3cr	25%	Ph.D. 1999, Ecology (Quantitative Option), Penn State University	Over 25 years of experience in applications of spatial analysis to environmental and public health issues; Over 30 peer-reviewed journal papers and book chapters;- Springer Monograph on Landscape Pattern Analysis for Assessing Ecosystem Condition
	GEP 620 Population Geography, Demography, and GISc 3 cr			

Faculty teaching at the graduate level must have an earned doctorate/terminal degree or demonstrate special competence in the field. Provide information on faculty members who are full-time at the institution and who will be teaching each course in the major field or graduate program. The application addendum for professional licensure, teacher certification, or educational leadership certification programs may provide additional directions for those types of proposals.

<b>Faculty Member Name and Title</b> (include and identify Program Director)	<b>Program Courses to be Taught</b>	<b>Percent Time to Program</b>	<b>Highest and Other Applicable Earned Degrees &amp; Disciplines</b> <small>(include College/University)</small>	<b>Additional Qualifications:</b> list related certifications/ licenses; occupational experience; scholarly contributions, etc.

**Table 3: Part-Time Faculty**

Faculty teaching at the graduate level must have an earned doctorate/terminal degree or demonstrate special competence in the field. Provide information on part-time faculty members who will be teaching each course in the major field or graduate program.

Faculty Member Name and Title	Program Courses to be Taught	Highest and Other Applicable Earned Degrees & Disciplines (include College/University)	Additional Qualifications: list related certifications/licenses; occupational experience; scholarly contributions, etc.
NA			



**Table 4: Faculty to be Hired**

If faculty must be hired, specify the number and title of new positions to be established and minimum qualifications.

Title/Rank of Position	No. of New Positions	Minimum Qualifications (including degree and discipline area)	F/T or P/T	Percent Time to Program	Expected Course Assignments	Expected Hiring Date
NA						

**Table 5: New Resources**

List **new** resources that will be engaged specifically as a result of the new program (e.g., a new faculty position or additional library resources). New resources for a given year should be carried over to the following year(s), with adjustments for inflation, if they represent a continuing cost.

New Expenditures	Year 1	Year 2	Year 3
Personnel (adjunct specialist instructors for specialty/professional skills courses)	4,000	4,000	4,000
Library	0	0	0
Laboratories and Equipment	0	0	0
Supplies & Expenses (Other Than Personal Service) (advertising and recruitment expenses, misc.)	1,000	1,000	1,000
Capital Expenditures	0	0	0
Other			
<b>Total all</b>	<b>\$5,000.00</b>	<b>\$5,000.00</b>	<b>\$5000.00</b>

**This completes the application for a Certificate or Advanced Certificate program.**

**State Education Department Contact Information**

New York State Education Department  
Office of Higher Education  
Office of College and University Evaluation  
89 Washington Avenue  
Albany, NY 12234  
(518) 474-2593 Fax: (518) 486-2779

[EXPEDITEDCERTS@mail.nysed.gov](mailto:EXPEDITEDCERTS@mail.nysed.gov)

## Catalog Description of Existing Courses

### **GEP 504 Basic Mapping Science: Applications and Analysis** (3 credits, 4 hours)

This course provides a focus on mapping: how to use maps to obtain information about a wide variety of topics and how to create maps to display and analyze both quantitative and qualitative data. Discussions include mental maps, aerial photos, remotely sensed images, computer-assisted cartography, and Geographical Information Systems (GIS). Laboratory work includes digital map applications and GIS mapping exercises.

### **GEP 505 Principles of GISc** (3 credits, 4 hours)

The use of Geographic Information Systems in the teaching of social, earth, and life sciences. Demographic studies and graphic presentation of demographic analyses. The use of modern mapping techniques in studies of the Earth Environment.

### **GEP 602 Biogeography and GISc** (4 credits, 5 hours)

The methods and techniques used to examine the past and current distribution of organisms, in the context of geophysical, evolutionary, and ecological processes. Study of the geographic ranges of living organisms and discussion of numerous relevant topics. Lab work will provide students with hands-on experience using GISc to explore such concepts as species distribution, island biogeography, and community fragmentation.

### **GEP 605 Special Projects in GISc: Environmental Analysis and Modeling with GISc** (4 credits, 6 hours)

Use of Geographic Information Systems for conducting research and spatial analyses in the natural and social sciences. The advanced use of computer mapping and spatial analysis technologies for studying the physical and human components of the Earth environment. Prerequisite: GEP 505 or instructor's permission.

### **GEP 606: Raster Analysis** (3 credits, 4 hours)

Focusing on the structure and the various ways in which raster data can be created, modified, and analyzed using a Geographic Information System (GIS). Topics include surface analysis, multi-criteria/multi-objective evaluation, and map algebra. The course combines lectures with weekly laboratory exercises designed to apply the concepts from the lectures and to develop students' expertise with GIS processing software. Prerequisite: GEP 505 or instructor's permission.

### **GEP 610 Spatial Analysis of Urban Health** (3 credits, 4 hours)

This course focuses on urban health issues using a geographical framework and covers topics such as the historical perspective of health, place, and society; mapping and measuring health and health impacts; the social and spatial patterning of health; the geography of health inequalities and disparities; health and social/spatial mobility; and the effects of urban segregation, overcrowding, and poverty on disease. Current research, as well as the seminal early works on the geographies of health, will be reviewed. Geographic Information Science will be used in the laboratory exercises to illustrate the theoretical concepts and to produce worked examples of health geography.

### **GEP 620 Demography and Population Geography with GISc** (3 credits, 4 hours)

The world's population in the context of geography and demography. The theoretical framework, defined by the fields of population geography and demography, will be studied and explored qualitatively and quantitatively.

Data sources and acquisition, population metrics (growth, change distribution, and composition), population and food supply, mortality, fertility, and migration. Lab work will provide students with hands-on experience using GISc to explore demographic concepts.

**GEP 621 Principles and Applications in Remote Sensing** (4 credits, 6 hours)

Fundamentals of remote sensing: energy interactions between the sun, atmosphere, and features on the earth surface. Structure of raster data, cell size, and both passive and active remote sensing. Spatial, spectral, radiometric and temporal resolution characteristics of different multispectral remotely sensed data using specialized image analysis software. Students will also be exposed to a wide variety of applications in environmental mapping and monitoring, natural resources management, urban and regional planning, and global change research.

**GEP 630 Geostatistics and Spatial Analytical Concepts** (3 credits, 4 hours)

Explores the emerging fields of geostatistics and spatial analysis. Various quantitative techniques will be studied and applied to real-world geographic problems. Exploratory spatial data analysis (ESDA) will be done within multiple GIS packages such as ArcGIS and GeoDa. Traditional statistics (e.g. incidence ratio, correlation, regression) as well as geo-statistics such as spatially-lagged regression, spatial error model, and geographically weighted regression (GWR) will be performed within various packages including SPSS, GWRIII, GeoDa, ArcGIS, [R], and Excel. Prerequisite: GEP 505 or instructor's permission

**GEP 631 Advanced Remote Sensing** (4 credits, 5 hours)

Advanced processing and analysis of satellite remote sensing imagery with an emphasis on change detection, advanced image classification methods, and the integrated use of remote sensing and GIS in geographical analysis. The course combines lectures with weekly laboratory exercises designed to apply the concepts from the lectures and develop students' expertise with remote sensing processing software. Prerequisite: GEP 621 or instructor's permission.

**GEP 632 Environmental Health and GISc** (3 credits, 4 hours)

This course explores the field of environmental health, especially focusing on spatial factors, medical geography, and the use of Geographic Information Science (GISc) to analyze relevant relationships between environmental impacts, diseases, demographics, socio-economic conditions, and the implications on public health and policy. Topics include environmental epidemiology, environmental toxicology, environmental justice, environmental policy, hazardous substances, air and water quality, food safety, global warming, population pressures, solid waste, occupational health, and risk assessment, as related to environmental health. Lab work uses GISc to examine and analyze environmental health, population, and built environment data for planning and research.

**GEP 635 Natural Hazards and Risk Analysis** (4 credits, 5 hours)

Fundamentals of the natural hazards and disasters origin; physical and social implications; methods of quantitative and qualitative analysis; elements of geographic, geological, social and political analysis applied to risk estimation and mitigation and management measures. Use of Geographic Information Systems (GIS) tools and analytical techniques in lab exercises and assignments. Prerequisite: GEP 505 or instructor's permission

**GEP 640 Urban Geography and GISc** (3 credits, 4 hours)

This course covers the contribution of geographical concepts and methods to an understanding of contemporary and future urban issues. It applies the use of GISc to the study of the internal structure of cities and urban systems, including city dynamics, classic and postmodern models, central place theory, urban migration and mobility, race, ethnicity, and gender, urban migration, poverty, industrial and post-industrial urban societies, residential segregation, land use change, gentrification, urban and suburban sprawl, housing, urban environmental issues, and regional planning. Lab work involves using GISc to explore the form and function of urban areas, and to solve critical urban problems using spatial analysis.

**GEP 641 Digital Image Analysis** (4 credits, 5 hours)

Introduction to digital image analysis; application of digital analysis techniques to remote sensing data, including mapping of land cover, land use, vegetation, geology, soil, built-up area, agricultural land, and forest. Digital image analysis techniques will include image processing, transformation, registration, and classification

using industry standard digital image analysis software. Advantages and limitations of digital image analysis techniques will be discussed. Prerequisite: GEP 621 or instructor's permission

**GEP-650 Topics in regional geography and applied mapping analysis** (4 credits, 5 hours)

This field-based course will teach students basics of field data investigation and analysis using Geographic Information Systems (GIS) and Global Positioning System (GPS) within the context of the local (regional) geographic settings. Students will select the topic of regional investigation and use both, literature and local (regional) resources to conduct their own applied geographic study. Use of GIS for mapping and data entry will provide students with necessary skills for practical work with collected terrain data and satellite imagery. Labs will use field data and datasets from NASA, USGS, NOAA and local sources (universities, data portals, etc.)

**GEP 660 Geovisualization and Analytical Cartography** (4 credits, 6 hours)

Students will utilize advanced Geographic Information Science (GISc) and graphic design techniques in tandem with licensed and free software to produce maps and geovisualizations of complex spatial data with a focus on understanding cartographic conventions and principles of good cartographic design. Maps will be studied critically in terms of their production, interpretation, and relationship to space and place. Prerequisite: GEP 505 or instructor's permission.

**GEP 662: Introduction to Programming for GISc** (3 credits, 4 hours)

Programming and scripting for Geographic Information Science (GISc) with a focus on applying programming methods to answer geographic questions. Students will learn how to use programming to automate geoprocessing tasks and develop new analytical tools. Prerequisite: GEP 505 or instructor's permission.

**GEP 664: Spatial Database Management** (3 credits, 4 hours)

Spatial Database Management with a focus on managing spatial data within a relational database for use with Geographic Information Systems. In addition to learning relational database concepts and Structured Query Language (SQL), students will learn how to create and manage a spatial database, manage database security, maintain data integrity and model spatial relationships within the database, and work within a multiuser editing environment. Prerequisite: GEP 505 or instructor's permission.

**GEP 675 Data Acquisition and Integration Methods for GISc Analysis** (3 credits, 4 hours)

The techniques and science behind field methods commonly used for the acquisition and creation of geospatial data. Various techniques for data capture as well as processing and analyzing the data within a geographic information system (GIS). Labs will focus on the hardware and software needed for data creation, the integration of this information into a coherent GIS, and basic concepts of analysis including point-pattern analysis. Students will use GPS devices, mobile GIS, workstation GIS, as well as data from other sources including satellite and airborne remotely sensed data. Prerequisite: GEP 505 or instructor's permission.

**GEP 680 Emerging Issues and Methods in Geographic Information Science** (3 credits, 4 hours. May be repeated up to 9 credits)

Current and innovative issues, technologies, and methods in the field of Geographic Information Science. Topics change from term to term, and might include Ethics in GISc; Critical Cartography; and New Technologies for Analysis. Prerequisite: GEP 505 or instructor's permission.

**GEP 689 Methods Seminar in Geographic Information Science (GISc)** (3 credits, 4 hours)

Current methods in the field of Geographic Information Science. The nature of scientific research, defining geographic problems, issues of scale and resolution, research design, scientific literature review, acquisition of relevant data, capturing information and mapping in GIS, analysis and interpretation of data, presenting scientific findings in written and oral formats. Prerequisite: GEP 505 or instructor's permission.

**GEP 690 Workshop in Geographic Information Science Research** (4 credits)

An advanced examination of mapping and of new computer-aided technologies in the natural and social sciences, including research design and methodology and designing and conducting an independent GIS research project, conforming to generally acceptable professional geographical practices and techniques, under the supervision of faculty. Prerequisite: GEP 605 or instructor's permission



## Definitions for Certificate and Advanced Certificate Proposals

### I. General Definitions\*

**Adequate, approved, equivalent, satisfactory, sufficient:** Adequate, approved, equivalent, satisfactory, sufficient, respectively in the judgment of the commissioner.

**Higher education** means postsecondary education, and includes the work of colleges, junior colleges, community colleges, two-year colleges, universities, professional and technical schools, and other degree-granting institutions.

**Advanced Certificate:** For the purposes of the expedited certificate process, a Certificate program that is composed of graduate-level courses.

**Branch campus:** A unit of an institution located at a place other than the institution's principal center or another degree-granting institution, at which the institution offers one or more curricula leading to a certificate or degree.

**Certificate:** A credential issued by an institution in recognition of the completion of a curriculum other than one leading to a degree.

**College:** A higher educational institution authorized by the Regents to confer degrees.

**Commissioner:** The Commissioner of Education.

**Course:** An organized series of instructional and learning activities dealing with a subject.

**Credit:** A unit of academic award applicable towards a degree offered by the institution.

**Curriculum or program:** The formal educational requirements necessary to qualify for certificates or degrees. A curriculum or program includes general education or specialized study in depth in a particular field, or both.

**Department:** The Education Department of the State of New York.

**Extension center:** A unit of an institution located at a place other than the institution's principal center or another degree-granting institution, at which the institution does not offer any curricula leading to a certificate or degree, but at which the institution either conducts more than 15 courses for credit or has more than 350 course registrations for credit in any academic year.

**Extension site:** A unit of an institution located at a place other than the institution's principal center or another degree-granting institution, at which the institution does not offer any curricula leading to a certificate or degree, and at which the institution conducts no more than 15 courses for credit and has no more than 350 course registrations for credit in any academic year.

**Junior college or two-year college:** A higher educational institution which is authorized by the Regents to offer undergraduate curricula below the baccalaureate level which normally lead to the associate degree.

**Principal center:** The location of the principal administrative offices and instructional facilities of a college, university, or other degree-granting institution, as defined by the institution's officers. In exceptional cases and with the approval of the commissioner, an institution may designate more than one principal center for an institution that offers curricula leading to degrees and that is part of a public or independent multi-institution system, *principal center* means the location of the institution's principal administrative offices and instructional facilities, as defined by the institution's officers, but not the location of the system's central administration.

**Registration:** Approval of a curriculum in an institution of higher education for general purposes, for admission to professional practice, or for acceptance toward a credential issued by the department or by the institution.

**Semester hour:** A credit, point, or other unit granted for the satisfactory completion of a course which requires at least 15 hours (of 50 minutes each) of instruction and at least 30 hours of supplementary assignments, except as otherwise provided pursuant to section 52.2(c)(4) of this Subchapter. This basic measure shall be adjusted proportionately to translate the value of other academic calendars and formats of study in relation to the credit granted for study during the two semesters that comprise an academic year.

**University:** A higher educational institution offering a range of registered undergraduate and graduate curricula in the liberal arts and sciences, degrees in two or more professional fields, and doctoral programs in at least three academic fields.

## **II. Format Definitions**

**Accelerated:** The program is offered in an accelerated curricular pattern which provides for early completion.

**Bilingual:** Instruction is given in English and in another language. By program completion, students are proficient in both languages. This is not intended to be used to identify programs in foreign language study.

**Day Program:** For programs having EVENING, WEEKEND, or EVENING/WEEKEND formats, indicates that all requirements for the degree or other award can also be completed during traditional daytime study.

**Distance Education:** A major portion of the requirements for the degree or other award can be completed through study delivered by distance education.

**Evening:** All requirements for the degree or other award must be offered during evening study.

**Evening/Weekend:** All requirements for the degree or other award must be offered during a combination of evening and weekend study.

**External:** All requirements for the degree or other award must be capable of completion through examination, without formal classroom study at the institution.

**Independent Study:** A major portion of the requirements for the degree or other award must be offered through independent study rather than through traditional classes.

**Language:** The program is taught in a language other than English.

**Not Full-Time:** The program cannot be completed on a full-time basis: for example, a 24-credit program that leads to a Certificate that cannot be completed in two semesters. Such programs are not eligible for TAP payments to students.

**Standard:** For programs having **Independent, Distance Education, External, or Accelerated** formats, indicates that all requirements for the degree or other award can also be completed in a standard, traditional format.

**Weekend:** All requirements for the degree or other award must be offered during weekend study.

\* From TITLE 8 CHAPTER II REGULATIONS OF THE COMMISSIONER, § 50.1