

Approval Form

Proposal Title: CERTIFICATE IN CARTOGRAPHY AND GIS

Sponsor(s) DICK SOTT Dept.: GEOGRAPHY & ANTHRO Ext. 6341
ALL COLLEGE FACULTY

Check one: Course Specialization Concentration Minor Achievement Certificate
 Certification Program Major Program Minor Change (please name deletion or credit/title/catalog change)

Undergraduate Graduate 21 Credit Hours

<p>Step 1 (Department)</p> <p><input checked="" type="checkbox"/> Approved _____ Date _____ <input type="checkbox"/> Not Approved _____ _____ Dept. CC Chairperson</p> <p><input checked="" type="checkbox"/> Reviewed _____ Date _____ <u>Richard A. Scott</u> Dept. Chairperson</p>	<p>Step 2 (Receipt)</p> <p><input checked="" type="checkbox"/> SCC# <u>93-24-104</u></p> <p>Proposal Received _____ Date _____</p> <p><u>William L. Robinson</u> <u>Charles A. Montagna</u> SCC Chairperson</p>	<p>Step 3 (School CC)</p> <p>Reviewed <u>2/3/94</u></p> <p><input checked="" type="checkbox"/> Approved <u>with revision</u> <input type="checkbox"/> Not Approved</p> <p>Comments: <u>see attached memo</u> <u>OK - JS 5/2/94</u></p> <p><u>Joanna Scull</u> School Curr. Comm. Chairperson</p>
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<p>Step 4 (Academic Dean)</p> <p><input checked="" type="checkbox"/> Recommend <input type="checkbox"/> Not Recommend <input type="checkbox"/> Conditionally Recommend (see comments)</p> <p>Reviewed <u>5/2/94</u> Date _____</p>	<p>Comments:</p> <p><u>Robert J. ...</u> Signature, Dean of School</p>
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Step 5 (SCC)

Open Hearing _____ Date _____ Approved by Senate Curriculum Committee _____ Date _____

Returned to sponsor(s) for the following reasons:
not to be reported for review change

Step 6 (Senate)

Presented to Senate _____ Date _____ Approved Not Approved

Notification to Executive Vice-President/Provost _____ Date _____ William L. Robinson
 Signature, SCC Chairperson

Step 7 (Executive V.P./Provost)

Received 6/18/94
Date

Approved Yes No

If no, reasons are as follows:

Student credit hours _____

Faculty load hours _____

Equalized credit hours _____

Official copy and approval sheet filed _____
Date

*Bot committee
6/18/94*

[Signature]
Signature, Executive Vice-President/Provost

Registrar

Approved course description received 22 Aug 94
Date

Hegis Taxonomy and Course Number assigned Cert # 9206

[Signature]
Signature, Registrar

22 Aug 94
Date

Notification forwarded:

- Senate Curriculum Committee Chairperson
- Department Chairperson(s)
- Academic Dean(s)
- Registrar
- Sponsor(s)

**Proposal for a Certificate Program:
Cartography and Geographical Information Systems**

1. Abstract of Proposal:

The title of this program, sponsored by all members of the geography faculty, is "Certificate in Cartography and Geographical Information Systems." The need for the program stems from the rapid growth in the use of automated methods in cartography and the surge in the development of Geographical Information Systems [GIS] in public sector agencies and private sector firms. As a result of this growth many professionals working in public agencies, such as planning boards, and private sector companies, such as engineering firms, could benefit from training in GIS and cartography. This program provides the education and training professionals working in these rapidly growing fields need to stay abreast of change.

Although the Geography and Anthropology Department will house and administer the program, it includes courses in several Rowan departments including Computer Science, Mathematics, and Management and Management Information Systems. Because those entering the program will come from diverse backgrounds, including computer science, geography, planning, environmental science, and business, we will keep the course requirements as flexible as possible to allow tailoring the courses taken by each student to his or her needs. For instance, a student entering the program from a traditional geography background would very likely take a combination of mathematics and computer science courses along with the geography courses required by the student's professional duties. A student with a background in computer science or management information systems would be advised to take a series of geographic techniques courses in cartography, digital cartography, remote sensing, and GIS. One very important implication of the likely diversity of the backgrounds of those entering the program is that strong, personalized, quality academic advising is imperative. This advising will ensure that those who complete the program will be able to achieve its specific objectives, which are listed later within this proposal, either as a result of coursework and projects carried out in conjunction with the program or as a result of previous training and experience in conjunction with coursework and projects carried out as part of the program.

We will seek approval of the certificate program during the coming academic year. During that time we will advertise the program to engineering firms, planning agencies, county health departments, and private consulting firms. The program initiation date will be the spring semester of 1995.

All of the courses that comprise the program are already a part of the curriculum of the participating departments. Staff, library holdings, and laboratory space are all adequate to support this program. Of course, computer hardware and software must be maintained at reasonably state-of-the-art levels for this program to succeed. The pending approval of \$1.9 million for enhancing academic computing at Rowan will ensure that our facilities will be at the state-of-the-art for years to come. The College has recently purchased four workstation licenses for ARC/INFO, the premier commercial GIS software product, and will soon receive the computer hardware on which the software will run. Thus, we are encouraged that we will be able to provide our students with state-of-the-art training on state-of-the-art equipment well into the future.

2. Details:

- a. Title of Proposal: Certificate in Cartography and Geographical Information Systems
- b. Sponsors: The geography faculty of the Department of Geography and Anthropology: Richard Scott, Chair, Edward Behm, Advisor, Wade Currier, Jerry Lint, Charles Stansfield, and Chet Zimolzak.
- c. Scope or size of program: The certificate will require students to complete 21 s.h. selected from the regular course offerings of the following departments: Computer Science, Geography and Anthropology, Management and Management Information Systems, and Mathematics. Although we have no precise estimate of the number of students who will choose to enroll in the program, the area with which the program is concerned is growing rapidly and is projected to continue rapid growth in the future.
- d. Relationship to curriculum: All courses comprising the program are general education or major courses offered regularly by the participating departments. High quality, personalized academic advising is imperative for the success of this program. We will advise students individually on course selection. In assisting program planning, this advising will take into account the previous training and education of the student along with his or her career goals.
- e. Eligibility: The program is open to students who are or who aspire to be working professionals requiring additional education and training in cartography, GIS, and related areas in order to work more effectively. In most instances students entering the program will have completed a bachelors degree in geography, computer science, business, or an environmental science area.
- f. Suggested time and scale of implementation: We plan to begin accepting students in the certificate program during the 1995 spring semester. Between now and then we will design advertising and advising materials and publicize the program with local public sector agencies and private sector firms.
- g. Resource requirements (equipment, library, staff, etc.): The equipment, library materials, faculty, office, and classroom facilities currently serving the geography major program will be used to serve the certificate program. Unless the program grows far beyond our current expectations, these resources will be adequate to support its needs. Currently some of our upper level courses have a modest amount of available room. Any demand generated by the certificate program should result in these classes having somewhat higher enrollment levels, which is a positive projected outcome. Of course, if there are more students in these upper level courses, then there will be a proportionately higher consumption of consumable materials such as plotter pens, drafting pens, and plotter paper. Should enrollment grow to the point that cost increases become a budget problem, then the department will institute a laboratory fee for those courses requiring additional materials.

We have consulted with the departments of Computer Science, Management and Management Information Systems, and Mathematics to ascertain the impact that certificate program students will have on these departments. Chairs and faculty members of the departments have assured us that they can accommodate the projected demand generated from students in the certificate program.

3. Rationale: The mission of Rowan College requires an emphasis on both liberal education and career preparation. Through liberal education "... the College fosters student acquisition of knowledge and stresses the importance of ethical reasoning, critical thinking, and appreciation and knowledge of cultural diversity."¹ The latest round of strategic planning mandated that the geography major program should "... continue to make effective use of technological developments within the geography major."² To say that the pace of technical change in our field is accelerating is commonplace to the point of cliché. Thus, not only our majors, but also our former students and those of other institutions need to maintain or attain technical currency in their specializations. The goal of the certificate program in cartography and GIS is to enable students who need to refresh or gain mapping science skills to obtain the training they require in order to carry out their professional responsibilities more effectively.

Our charge to "continue to make effective use of technical developments" implies that we should make those developments available to as many groups of potential users as possible. We can enhance technical dissemination by creating a certificate program to enable those already working in the field to appreciate and employ the benefits of these fascinating new technologies more fully.

4. Essence of the Certificate Program:

- a. Major goal of the program. The major goal of this program is to provide those who have already earned a bachelors degree and who are currently working in the mapping sciences or who aspire to enter these professions an opportunity to gain the knowledge and technical competence required to succeed in their careers. Because we anticipate that those entering the program will come from diverse backgrounds and will aspire to various goals, we have decided to keep the requirements flexible so that we can tailor the program to fit the needs of its participants. Thus, the courses from which students can select are from four disciplines: computer science, geography, management information systems, and mathematics. To assure technical competence, we will require students to demonstrate competency in at least three of these four areas. Students entering the program will complete an assessment designed to ascertain their level of competency at the outset. Program advisors will use the results of the assessment along with the student's goals to plan the student's program. All students will take a set of at least seven courses selected in consultation with the program advisor.
- b. Specific objectives of the program. Here we outline specific objectives students will pursue:
 1. Students who complete this program will be both numerate and computer literate to the degree appropriate to their career objectives. Those possessing these competencies as a result of previous training will not be required to complete computer science or mathematics courses as part of the program. Those unable to demonstrate these competencies will be required to complete an appropriate set of mathematics and computer science courses in order to achieve an appropriate level of competence in these areas. The minimum level of competency required of all students will be that expected of those who have completed one year of college level mathematics and one

¹ Focused Mission Statement as revised February 2, 1991.

² Glassboro State College and the Future: Towards a Regional Institution of Excellence: The Glassboro State College Strategic Plan: July 1, 1992 - June 30,1997, P. 126.

semester of computer programming.³ Students who wish to pursue a GIS certificate must demonstrate a level of programming competency expected of those who have completed at least one year of college level programming courses.

2. Students who complete this program with an emphasis in GIS or in digital cartography will be able to define and explain the advantages and disadvantages of the major models of database structure, will be able to outline the design principles for effective database management, and will be able to use one of the major commercial database management packages such as dBase.
3. Students will be able to demonstrate basic cartographic/graphic literacy. They will possess understanding of the various types of map projections and their uses and limitations. They will understand the basics of cartographic communication and map symbolization, and will be able to explain the uses of maps in geographic inquiry. Additionally, they will demonstrate the ability to interpret topographical and thematic maps accurately.
4. Students will be able to demonstrate basic knowledge of each of the following mapping science areas: 1. cartography, 2. remote sensing and photo interpretation, 3. geographical information systems, digital cartography, and 4. spatial analysis
5. Students will be able to demonstrate advanced levels of competency in one of the areas outlined in item four.
6. Students will keep a portfolio of the work they produce in geographic techniques courses. This portfolio, which will be subjected to faculty review, will demonstrate the student's mastery of the specific technique or techniques the student has emphasized in his or her program (e.g., photo interpretation and GIS).
7. To demonstrate competency in skills learned in techniques courses, students will complete a capstone project chosen in consultation with the academic advisor. In completing this project the student will demonstrate in-depth competency in the use of one geographic technique. This could include such things as applying map design principles to making a map with a computer mapping package, or use of a Geographical Information System to solve a locational problem. If possible, the software used in the capstone project should be the program or programs the student expects to use on the job.

c. Structure or Organization.

³ The courses students will take are listed later in this document.

Students completing the certificate program will take a battery of at least seven courses selected in consultation with the program advisor and in light of the base line assessment. In making course selections, student and advisor shall consider the academic background and career goals of the student. All students entering the program are required to complete a base line assessment. This assessment will consist of a written examination followed by a personal interview in which the student may present transcripts verifying previous course work, examples of cartographic work, and other pertinent information.

By the time of completion of the program, students will exhibit through life experience or course selection a diverse knowledge in three of the four disciplinary areas represented in the certificate program. Those who are unable to demonstrate such competency through the base line assessment and interview will be required to take courses in at least three of the disciplines in order to attain the required level competency expected of those who complete the program. Students who are able to demonstrate competency in one or more areas at the outset will be encouraged to take a more specialized set of courses concentrating in areas in which initial competence is weaker.

The following table lists the courses included in the certificate program. Students with special needs may petition to have other courses included in their programs. All such inclusions require approval by the program advisor, who may consult with the chair of the course's home department. For example, if a student wishes to have a course in linear algebra included in her or his program, then the program advisor in the Department of Geography and Anthropology, consulting with the chair of the Mathematics Department, will approve the exception. This procedure will ensure flexibility while avoiding chaos.

Table 1. Certificate Program Courses

Business Courses	Course Number
End-User Computing: Database Management [1 s.h.]	0702.210
Design of Database Systems	0702.338
Computer Science Courses	Course Number
Introduction to Programming	0701.102
Structured Programming in Pascal	0704.103
Data Structures and Algorithms	0704.222
Programming Languages	0704.315
Mathematics Courses	Course Number
Precalculus Mathematics	1701.122
Calculus: Techniques and Applications	1703.125
Calculus I	1701.130
Calculus II	1701.131
Discrete Mathematics	1703.150
Geography Courses	Course Number
Introduction to the Mapping Sciences	2206-193
Cartography	2206-306
Directed Field Experiences	2206-307
Remote Sensing / Air Photo Interpretation	2206-308
Remote Sensing II	2206-309
Land Use and Resource Development	2206-310
Geography of Transportation	2206-313
Spatial Analysis	2206-314
Field Studies	2206-315
Computer Cartography	2206-320
Advanced Cartography	2206-321
Quantitative Methods	2206-350
Metropolitan and Regional Planning	2206-355
Introduction to GIS	2206-360
Advanced GIS	2206-415

The interests of personalization and flexibility, along with the diverse backgrounds and goals of the students likely to enroll, preclude establishing rigidly fixed tracks for the certificate program. Course selection will be guided by the need to ensure attainment of the program goal of competency in three of the four component disciplines. Nevertheless, we do want to suggest example sets of courses that constitute

appropriate selections for students with a variety of backgrounds and objectives. The first track we outline is intended for a professional in the planning field who has had minimal background in computing, but wishes to learn GIS so that she can work with the new system her agency will soon acquire. This individual does not require extensive background in computer science, but does need to know enough programming to work intelligently with a GIS that has a built in macro language that enables the user to write analysis procedures.

Table 2. Example Track for Planner

Course	Course Number
Introduction to Programming	0701.102
End-User Computing: Database Management [1 s.h.]	0702.21
Design of Database Systems	0702.338
Remote Sensing / Air Photo Interpretation	2206-308
Introduction to GIS	2206-360
Advanced GIS	2206-415
Computer Cartography	2206-320

A second example track represents a course sequence followed by a GIS operator who already has a degree in geography and wishes to gain a computer science background that will enable more technical applications of GIS. This individual already is familiar with the operation and principles of a commercial GIS and is hoping to begin programming add-on functions required to carry out specialized operations and procedures.

Table 3. Example Track for GIS Operator

Course Name	Course Number
Introduction to Programming	0701.102
Discrete Mathematics	1703.150
Structured Programming in Pascal	0704.103
Data Structures and Algorithms	0704.222
Programming Languages	0704.315
Design of Database Systems	0702.338
Advanced GIS	2206-415

A third example track specifies a course of study designed for a programmer with a degree in computer science who wishes to enter the mapping sciences. This individual has a very strong mathematics and computer science background, but no geography or cartography training. The individual seeks a position as a GIS analyst or digital cartographer.

Table 4. Example Track for Computer Science Major

Take All of These	Course Number
Introduction to the Mapping Sciences	2206-193
Cartography	2206-306
Remote Sensing / Air Photo Interpretation	2206-308
Introduction to GIS	2206-360
Computer Cartography	2206-320
Plus Any Two of the Following	
Land Use and Resource Development	2206-110
Geography of Transportation	2206-313
Metropolitan and Regional Planning	2206-355
Advanced Cartography	2206-320
Remote Sensing II	2206-309
Advanced GIS	2206-415

These example tracks by no means exhaust the possible combinations of courses students could take. They are intended to provide illustrative examples.

d. Administration:

The Department of Geography and Anthropology will administer the program. The department chair and academic advisor will have day-to-day responsibility for ensuring the smooth functioning and interdepartmental coordination of the program. The administering department shall consult with the chairs of the following departments in order to obtain approval of any changes in the requirements for the certificate program: Computer Science, Management and Management Information Systems, and Mathematics. Specifically, the administering department shall consult with the home department prior to adding or deleting any of that department's courses. In addition, the administering department shall consult with participating departments from time-to-time in order to ensure smooth functioning of the program. These consultations may concern a variety of issues including, but not limited to frequency and time of course scheduling, course content, and any other issues of concern. Any of the participating departments may call a meeting of the Chairs of participating departments in order to deal with issues that arise.

5. Results of consultation:

The chair of the Department of Geography and Anthropology has consulted with the following department chairs: Dr. Don Stone of Computer Science, Dr. Diane Hamilton of Management and Management Information Systems, and Dr. Gary Itzkowitz of Mathematics. I have also discussed the certificate program and sought advice from the following faculty members in participating departments: Dr. Mike Berman and Mr. Seth Bergman of Computer Science, and Dr. Ron Czochoer of Mathematics. Their suggestions or letters summarizing their suggestions follow.

To: Richard Scott, Geography and Anthropology
From: Don Stone and Mike Berman, Computer Science
Date: Oct. 31, 1993
Re: Proposal for an certificate program in cartography
and geographical information systems

DCS : [handwritten initials]

We have reviewed your proposal for a certificate program in cartography and geographical information systems, and we believe that the proposed program has been well thought out and can be of benefit to people in a number of different situations. The computer science component of the proposed program appears to be appropriate. GIS is certainly a rapidly growing area, and this program should help focus the College's efforts to be a resource in this area. The success and popularity of the current offerings in cartography and GIS lead us to expect that this program would have a significant enrollment.



Rowan College of New Jersey

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Mathematics Department

October 20, 1993

Richard A. Scott,
Professor and Chair
Dept. of Geography & Anthropology

Dear Prof. Scott,

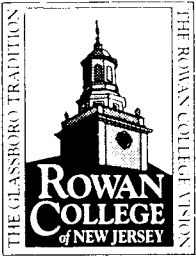
I have looked over your proposal for a Certificate Program: Cartography and Geographical Information Systems, and I heartily support it. The rapid growth of automated methods in cartography in public agencies, such as planning boards, and in private sector companies, such as engineering companies, demands the kind of training that this certificate program can provide in G.I.S. and cartography.

My best wishes go out to you and your department with this program.

Cordially,

Gary S. Itzkowitz, Ph.D, Chair

GSI:cvr



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*School of Business Administration
Department of Management and Management Information Systems*

DATE: October 13, 1993

TO: Richard A. Scott
Chairperson, Geography Department

FROM: diane hamilton *diane hamilton*
Chairperson, Management & M.I.S. Department

RE: proposal for cartography & G.I.S. program

I have read your proposal and it sounds very interesting. I believe we can support your proposal as it is written, assuming there isn't a super large demand for the program. That is, we offer one section of Design of Data Base each fall and spring. We could certainly assimilate five or ten more students in each class, however, a much larger demand would require us to offer more sections, thus needing more resources. Regarding the E.U.C. - Database course, this course generally has insufficient enrollment to run. Therefore, if we were to get a couple of your students, we might have more luck retaining this course on our schedule. Just one final thing, these courses are not "management" courses as mentioned in your proposal; they are "management information systems" courses.



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Mathematics Department

MEMO
Mathematics Department

TO: Richard Scott

FROM: Ron Czochoz *RC*

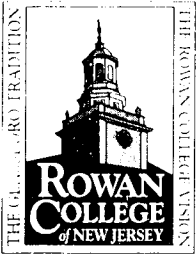
DATE: October 18, 1993

RE: Certificate Program in Cartography and GIS

Thank you for the opportunity to review your department's proposal for the Certificate in Cartography and GIS. I am very enthusiastic about this proposal because of the opportunity it presents to our mathematics major to find an interesting application of their mathematics training. While the elementary nature of the suggested mathematics requirements makes it evident that this was not designed with them in mind, the flexibility of the program leaves many possibilities for structuring a set of courses for our majors to take.

With respect to the mathematics courses listed in the proposal, I think that the level and scope of the courses are very appropriate for those entering the program. If competency in these elementary mathematics courses should be considered required for all who enter the certificate program in GIS, it should be stated. Since these courses actually serve to provide a basic foundation in mathematics and not as courses that pertain directly to the subject matter of the certificate, I think the reason for including specific math courses should be specified. (i.e. In what situation would Precalculus and Calculus: Techniques and Applications be required? Is Discrete Math included because it is beneficial for those who are going to be more involved with the data structures aspect of the certificate?) Since the courses listed are elementary courses, I would suggest that they be listed as prerequisites for the program, and not as part of the program.

Overall, I strongly support the proposal and believe it will be beneficial for our students especially if it could also be available as a Concentration.



Rowan College of New Jersey

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Computer Science Department

Memo To: Richard Scott

From: Seth Bergmann SB

Subject: Proposal for Certificate in Cartography and G.I.S.

Date: October 20, 1993

I have read your proposal for a certificate program in Cartography and Geographical Information Systems. It is clear that as technology improves, we will see increasingly sophisticated tools for geographers with decreasing costs. At the same time we will see improved user interfaces which will enable people without extensive computer expertise to make use of these tools.

I strongly support your proposal and believe it will be a significant enhancement to the college's offerings. It is my hope that my department can contribute to the proposed program.