

GEOGRAPHIC INFORMATION SCIENCE

THE FACULTY

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MASTER OF SCIENCE IN GEOGRAPHIC INFORMATION SCIENCE (GIS)

The Master of Science in Geographic Information Science (GIS) degree is designed for professionals seeking to enhance their knowledge of the analysis, management, and communication of geographic information. It combines the development of strong technical skills and in-depth understanding of geographic information science and theory.

LEARNING OUTCOMES

Upon completion of this program, students will be able to

- demonstrate comprehensive knowledge of the functionality of GIS technology,
- express an understanding of the fundamental theory and concepts upon which the technology is built,
- demonstrate high level skills in spatial analysis and geospatial problem solving,
- demonstrate mastery of market-leading geospatial software and hardware,
- understand recent and ongoing advances in geographic information science,
- understand the process of needs analysis, system design and implementation of GIS within organizations,
- design and implement a substantial GIS project, and
- effectively communicate and present project results in oral, written, and graphic forms.

ENTRANCE REQUIREMENTS

Minimum requirements for entrance include

- A bachelor's degree or equivalent in any field.
- Two letters of recommendation confirming the applicant's potential for success in the program.
- Competence in speaking and writing English. Students for whom English is a second language must demonstrate competence by submitting a Test of English as a Foreign Language (TOEFL) score above 550 written (210 computer-based. Internet-based minimum of 80 with no section score lower than 18). Alternative internationally recognized tests such as International English Language Testing System (IELTS) overall score at band 6.5 or above may be considered equivalent.
- Analytical and technical aptitude demonstrated through appropriate coursework, professional experience, Graduate Record Examination (GRE) or similar test scores, or letters of recommendation.

PROGRAM STRUCTURE

The one-year program consists of 10 months of coursework and the undertaking of a Major Individual Project (MIP). Each of the six terms is seven weeks in length and the annual schedule allows for two three-week breaks. Student cohorts begin each year in September and January.

The two-year program consists of up to 12 seven-week terms, with corresponding three-week breaks as in the one-year program.

Each of the first three seven-week terms includes a core theory course (GIS 61X series) on a major GIS systems theme paired with an intensive, hands-on technology course (GIS 62X series). Additional theory courses are offered in terms four and five and as electives (GIS 66X and GIS 67X series). Theory courses not only complement the technology courses and ensure that students have the critical theoretical foundations for the relevant technology, but also explore broader issues related to effective and appropriate application of the technology. A menu of short workshops (GIS 660) is offered throughout the program to provide opportunities for students to selectively focus their attention on one of the many major themes in GIS, specific application areas, or advanced theory topics.

Each of the first four terms includes one or more intensive multi-day, instructor-led course(s) from the current Esri software training curriculum (GIS 640). GIS Colloquium (GIS 630) is offered most Wednesday afternoons during the year. These colloquia give students exposure to cutting-edge research and developments in GIS and an opportunity to hear from some of the most well-known GIS scholars and managers.

All students are required to undertake a Major Individual Project (MIP) that applies GI Technology and/or Science to a problem of their choice. This is the professional equivalent of an academic masters thesis. The Project Course series (GIS 69X) is directed toward building students' skills in project design and implementation.

Opportunities for projects come from University of Redlands Faculty, organizations in the region, or from students' former, current, or future employers. Students begin developing their MIP topics during the beginning of the GIS 69X series and in conjunction with their MIP Advisory Committees and make gradual progress toward completing the MIP by the end of their program, be it one year or two. Before graduating, all students must successfully pass an oral defense of their project work before they finalize their Advisory Committee and submit an approved extended written report on the work completed. Students are also required to make a public presentation of their MIP before an audience of their peers and colleagues in the discipline of their project.

PROGRAM REQUIREMENTS

Master of Science 42 credits

The Master of Science degree requires 42 credits at the graduate level, which are comprised of 10 credits of theory courses, 7 credits of technology courses, 14 credits of project courses, 5 credits of professional practice courses, and 6 credits of elective courses. Elective courses can be taken in the form of GIS workshops, topics courses that are offered from time to time by GIS-related faculty, University of Redlands School of Business GIS-focused electives, or by individualized study, the focus of which is determined by GIS faculty.

COURSES:

THEORY COURSES: 10 CREDITS

- GIS 611 Fundamentals of Geographic Information (2)
- GIS 612 Information Systems Foundations for GIS (2)
- GIS 615 Communicating Geographic Information (2)
- GIS 616 Statistics & Spatial Analysis (2)
- GIS 617 Programming for GIS (2)

TECHNOLOGY COURSES: 7 CREDITS

- GIS 621 Introduction to GI Technology (2)
- GIS 625 Introduction to Image Data (1)
- GIS 622 Creating and Managing Geodatabases (2)
- GIS 624 GIS for the Web (2)

PROJECT COURSES: 14 CREDITS

- GIS 691 Project Concept & Scope (2)
- GIS 692 Project Initiation & Planning (1)
- GIS 693 Project Analysis & Design (1)
- GIS 694 Project Execution (1)
- GIS 695 Project Implementation (2)
- GIS 696A Project Completion (6)
- GIS 696B Project Closure (1)

PROFESSIONAL PRACTICE: 5 CREDITS

- GIS 630 GIS Colloquium (2)
- GIS 640 GIS Software Training (3)

ELECTIVES: 6 CREDITS

- GIS 660 GIS Workshops (1–4)
- GIS 661 Topics Course(s) (1–2)
- GIS 663 Remote Sensing & Image Processing (2)
- GIS 665 Advanced Topics in Spatial Analysis (1)
- GISB 691W GIS for Marketing (4)
- GIS 671, GIS 672, GIS 673 Individualized Study (1–2)

The most current information about the curriculum, entrance requirements, and application procedures is available on the program's website at www.msgis.redlands.edu or by contacting the program office at (909) 748-8128 or by e-mail at msgis@redlands.edu.

MASTER OF GEOGRAPHIC INFORMATION SCIENCE (MGIS)

The Master of Geographic Information Science (MGIS) degree is designed for professionals seeking to enhance their knowledge of the analysis, management, and communication of geographic information. It combines the development of strong technical skills and in-depth understanding of geographic information science and theories.

LEARNING OUTCOMES

Upon completion of this program, students will be able to

- understand spatial aspects of an external client's GIS needs and develop a practical project plan for addressing those needs,
- design, compile, and develop a spatial database and a set of analytical tools into a system appropriate to the problem,
- demonstrate a mastery of geographic analysis and cartographic skills,
- communicate the project process and the results in written, oral, and graphic medium at a professional level.

ENTRANCE REQUIREMENTS

Minimum requirements for entrance include

- a bachelor's degree or equivalent in any field
- two letters of recommendation confirming the applicant's potential for success in the program
- competence in speaking and writing English. Students for whom English is a second language must demonstrate competence by submitting Test of English as a Foreign Language (TOEFL) scores above 550 written (210 computer-based. Internet-based minimum of 80 with no section score lower than 18). Alternative internationally recognized tests such as International English Language Testing System (IELTS) scores at band 6.5 or above may be considered equivalent
- analytical and technical aptitude demonstrated through appropriate coursework, professional experience, Graduate Record Examination (GRE) or similar test scores, or letters of recommendation

PROGRAM STRUCTURE

The program consists of 8 months of coursework and the undertaking of an internship of 400 hours. Each of the four terms is seven weeks in length and the annual schedule allows for one three-week break. Student cohorts begin each year in September and January.

Each of the first three seven-week terms includes a core theory course (GIS 61X series) on a major GIS system theme paired with an intensive, hands-on technology course (GIS 62X series). Additional theory courses are offered in term four and as electives (GIS 66X and GIS 67X series). Theory courses not only complement the technology courses and ensure that students have the critical theoretical foundations for the relevant technology, but also explore broader issues related to effective and appropriate application of the technology. A menu of short workshops (GIS 660) is offered throughout the program to provide opportunities for students to selectively focus their attention on one of the many major themes in GIS, specific application areas, or advanced theory topics.

Each of the four terms includes one or more intensive multi-day, instructor-led courses from the current Esri software training curriculum (GIS 640). GIS Colloquium (GIS 630) is offered on a weekly schedule during the year. These colloquia give students exposure to cutting-edge research and developments in GIS and an opportunity to hear from some of the most well-known GIS scholars and managers.

All students are required to take project courses and a professional GIS internship that applies GI Technology and/or Science within a professional practice (GIS 697). The GIS Internship is directed toward enhancing students' skills in building GIS applications and solving geospatial problems.

PROGRAM REQUIREMENTS

Master of GIS 42 credits

The Master of GIS degree requires 42 credits at the graduate level which are comprised of 10 credits of theory courses, 7 credits of technology courses, 5 credits of project courses, 5 credits of professional practice courses, 6 credits of elective courses, and 9 credits of GIS Internship. Elective courses can be taken in the form of regularly offered GIS workshops, electives, topics courses that are offered from time to time by GIS-related faculty, University of Redlands School of Business GIS-focused electives, or by individualized study, the focus of which is determined by GIS faculty.

COURSES

THEORY COURSES: 10 CREDITS

- GIS 611 Fundamentals of Geographic Information (2)
- GIS 612 Information Systems Foundations for GIS (2)
- GIS 617 Programming for GIS (2)
- GIS 616 Statistics and Spatial Analysis (2)
- GIS 615 Communicating Geographic Information (2)

TECHNOLOGY COURSES: 7 CREDITS

- GIS 621 Introduction to GI Technology (2)
- GIS 625 Introduction to Image Data (1)
- GIS 622 Creating and Managing Geodatabases (2)
- GIS 624 GIS for the Web (2)

PROJECT COURSES: 5 CREDITS

- GIS 691 Project Concept and Scope (2)
- GIS 692 Project Initiation and Planning (1)
- GIS 693 Project Analysis and Design (1)
- GIS 694 Project Execution (1)

PROFESSIONAL PRACTICE: 5 CREDITS

- GIS 630 GIS Colloquium (2)
- GIS 640 GIS Software Training (3)

ELECTIVES: 6 CREDITS

- GIS 660 GIS Workshops (1–4)
- GIS 661 Topics Course(s) (1–2)
- GIS 663 Remote Sensing and Image Processing (2)
- GIS 665 Advanced Topics in Spatial Analysis (1)
- GISB 691W GIS for Marketing (4)
- GIS 671/GIS 672/GIS 673 Individualized Study (1-2)

GIS INTERNSHIP: 9 CREDITS

- GIS 697 GIS Internship (3–9)

The most current information about the curriculum, entrance requirements, and application procedures is available on the program's website at www.msgis.redlands.edu or by contacting the program office at (909) 748-8128 or by e-mail at: mgis@redlands.edu.

COURSE DESCRIPTIONS (GIS)

611 Fundamentals of Geographic Information. (2).

Modeling geographic reality in information systems, from its conceptualization and generalization from the real world, to its digital representation in the computer and back to the relationship between results of this digital manipulation and the real world it represents.

Prerequisite: enrollment in MS GIS or MGIS program or by permission of the instructor.

Numeric grade only.

612 Information Systems Foundations for GIS. (2).

Provides fundamental theoretical knowledge about information systems in general and the unique demands created by geographic information. Introduces students to concepts of information systems theory, systems design and architecture, databases and data modeling, and data interoperability standards as applied to geographic information science.

Prerequisite: GIS 611 or by permission of the instructor.

Numeric grade only.

615 Communicating Geographic Information. (2).

Begins with basic theory of cartographic and graphic data as it applies to GIS data. Explores GIS data models to support mapping and various advanced applications of cartographic methods, including multivariate mapping, multi-scale mapping, cartographic visualization including mixed virtual reality, animated and interactive mapping, and Web mapping.

Prerequisite: GIS 611 or by permission of the instructor.

Numeric grade only.

616 Statistics and Spatial Analysis. (2).

Combines a survey of statistical foundations needed by GIS practitioners with a detailed understanding of the range of spatial analytical techniques and the skills necessary for expert application of these techniques to specific problems. Includes fundamental concepts needed to understand advanced rule-based, statistical, process-based, and deterministic methods of spatial analysis.

Prerequisite: GIS 611 or by permission of the instructor.

Numeric grade only.

617 Programming for GIS. (2).

Introduction to programming concepts necessary for GIS: writing simple statements, organizing code, handling user interaction, and incorporating decision-making logic in code. Introduction to object-oriented programming concepts: methods, properties, and event-driven programming.

Prerequisite: GIS 611 or by permission of the instructor.

Numeric grade only.

621 Introduction to Geographic Information Technology. (2).

Provides necessary foundation skills in geographic information technology, including scanning, digitalizing, geo-referencing, datums, projections, coordinate systems, metadata, terrain modeling, geocoding, and GPS. Individual and group work complements theory and concepts taught in 611.

Prerequisite: enrollment in MS GIS or MGIS Program or by permission of the instructor.

Numeric grade only.

622 Creating and Managing Geodatabases. (2).

Focuses on the important database component of GI Technology. Following an intensive training course to acquire geodatabase design skills, students undertake group work on supervised class projects supplementing taught theory and technology concepts.

Prerequisite: GIS 621 or by permission of the instructor.

Numeric grade only.

624 GIS for the Web. (2).

Practices the skills needed to create GIS applications for the Web and other networks. Through hands-on projects, students will create their own Web GIS application; in-depth discussions of issues that affect Web GIS from network and security concerns to design for focused and effective Web applications.

Prerequisite: GIS 621 or by permission of the instructor.

Numeric grade only.

625 Introduction to Image Data. (1).

Covers the fundamentals of remotely sensed image data—physics, spectral signature, and basics of visual interpretation. Students will be required to acquire image data and perform extended interpretation of their study area.

Prerequisite: enrollment in MS GIS or MGIS program or by permission of the instructor.

Numeric grade only.

630 MS GIS Colloquium. (2).

Provides student exposure to advanced research and innovative developments in GI Systems and Science and the opportunity to hear presentations from GIS researchers, analysts, developers, and managers who live in or visit the Redlands region. Also includes participation in the annual Esri User Conference.

Prerequisite: enrollment in MS GIS or MGIS program or by permission of the instructor.

Credit/no credit only.

640 GIS Software Training. (3).

A series of intensive two- to five-day, hands-on training courses in the use of the ArcGIS suite of software products; approximately 20 days of training are required during the program.

Prerequisite: enrollment in MS GIS or MGIS program or by permission of the instructor.

Credit/no credit only.

660 GIS Workshops. (1–4).

Topic-oriented workshops in various GIS applications will be offered for the students to choose “cafeteria style.” Approximately 10 workshops will be offered per calendar year and students are required to attend a minimum of four workshops during the term of their program.

Prerequisite: enrollment in MS GIS or MGIS program or by permission of the instructor.

Credit/no credit only.

661 Topics in GIS. (1–2).

Designed to reflect curriculum trends and emerging GIS technology.

May be repeated for degree credit, given different topics, for a maximum of 4 credits.

Prerequisite: enrollment in MS GIS or MGIS Program or by permission of the instructor.

Offered as needed.

663 Remote Sensing and Image Processing. (2).

This elective course is designed for students to gain a greater understanding of remote sensing and the ability to process images for GIS applications. Covers various software applications and an extended classification of their study area. Special topics of hyperspectral, advanced classification, active sensors, and non-reflective image data will be included.

Prerequisite: GIS 625 or by permission of the instructor.

Numeric grade only.

665 Advanced Topics in Spatial Analysis. (1).

Introduction to commonly used spatial statistics in geographic analysis. Major topics include spatial point pattern analysis, spatial auto-correlation, local statistics, geographically weighted regression, and spatial regression models. Students will gain in-depth understanding of spatial stochastic processes and enhance their analytical skills.

Prerequisite: GIS 616 or by permission of the instructor.

Numeric grade only.

671, 672, 673 Individualized Study. (1–2).

Individualized study courses of 1–2 credits offered for students to design their own course of study in a particular GIS topic.

Prerequisites: enrollment in MS GIS or MGIS Program and approval of the instructor.

Credit/no credit only.

691 Project Concept and Scope. (2).

The objective of this course is to initiate the concept and scope of the student's Major Individual Project (MIP). Students will identify their project client and topic, conduct preliminary research on the topic and write a background paper outlining previous research and studies on their topic.

Prerequisite: enrollment in MS GIS program, or by permission of Program Director.

Numeric grade only.

692 Project Initiation and Planning. (1).

Students will conduct a feasibility analysis of their MIP concept and develop a plan that establishes the strategic goals, schedule, and budget for solving the problem with a technical solution. The final assignment for this course is a formal Project Plan with the project scope, goals, time line, and budget fully specified.

Prerequisite: GIS 691.

Numeric grade only.

693 Project Analysis and Design. (1).

Students will investigate the basic principles of systems analysis and design through a user's needs assessment and a requirements analysis. The final assignment for this course will be a Project Design Specification defining the system architecture, technical features, and data components.

Prerequisite: GIS 692.

Numeric grade only.

694 Project Design. (1).

Covers the basic procedures for executing a GIS project following the systems analysis and design phases, and techniques for successfully executing and managing a GIS project through construction and deployment.

Prerequisite: GIS 693.

Numeric grade only.

695 Project Implementation. (2).

This is the fifth course in the Project Series designed to assist the student with implementation of the GIS solution for their MIP.

May be repeated for degree credit.

Prerequisite: GIS 694 and enrollment in MS GIS program.

Credit/no credit only.

696A Project Completion. (6).

The final term of the program is spent completing the Major Individual Project (MIP). A defense, public presentation, and extended report are required.

Prerequisite: GIS 695 and enrollment in MS GIS Program.

Numeric grade only.

696B Project Closure. (1).

All of the final graduation requirements, including the submission and approval of the MIP, is encompassed in this final unit of credit.

May be repeated for degree credit for a maximum of 3 credits.

Prerequisite: GIS 696A and enrollment in MS GIS Program.

Numeric grade only.

697 GIS Internship. (3-9).

Internship and academic work under faculty. May be repeated as internship. May span across semesters.

Prerequisite: GIS 694 and enrollment in MGIS program, or by permission of Program Director.

Credit/no credit only.