Masters of Geographic Information Systems Technology (MS-GIST)

and the

Professional in Geographic Information Systems Technology Certificate

Student Handbook

THE UNIVERSITY OF ARIZONA

(Last Revised 1/2019)

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Welcome from the Director

As you begin your journey to the completion of a professional degree or certificate in GIST, you are entering an exciting, growing, and crucially important field. Some of today's most complex and pressing challenges are acutely spatial, ranging from environmental concerns such as global climate change, habitat destruction, deforestation, drought, to socio-cultural issues such as terrorism, human health, sustainability, urbanization, globalization, and resource consumption. As such, geographic information science will be a critical underpinning to research in both the natural and social sciences in the 21st century, allowing interdisciplinary collaboration and an understanding of the detailed spatial context of these phenomena in a way that has only recently become possible. Furthermore, geospatial technology has become ubiquitous, accessible to anyone in the world with a computer or mobile device. In fact, geospatial technologies are one of the fastest-growing industries today, offering numerous and varied employment opportunities across a broad range of applications.

Here at the University of Arizona, we believe that the best way to learn GIS and prepare to enter its workforce is through direct contact between professors, staff, and students, who forge a learning community that is not simply a transfer of information from a professor to a student, but is an interactive model of learning in which we help each other extend our knowledge. The focus on learner-centered education means that you cannot simply sit back, take tests, do lab work, and graduate. Rather, project-based learning is an integral part of this program. Geographic problem-solving coupled with creative and critical thinking will develop your skill base. Peer interaction and professional critiques from your professors and your fellow students will hone your skills. Hands-on, real-world experiences will develop your time and project management skills, teach you data compilation and database design, help you learn how to choose the best analytical techniques to solve a given problem, and afford opportunities for the professional presentation of results. In the final analysis, what you put into the program is what you will get out of the program.

We are excited to begin this journey with you in the MS-GIST program and PGIST certificate, and we challenge you to push yourself to expand your knowledge, skill base, and network to achieve your goals.

Welcome to the University of Arizona's Geographic Information Systems Technology programs.

Dr. Chris Lukinbeal, Director

The GIST Graduate Programs and Certificate

Geographic information is used across a wide range of fields, from real estate and marketing to urban and environmental planning. That is why the US Department of Labor suggests that geographic information-related positions will grow by almost 30% over the next ten years, making this field one of the fastest growing in the United States. The University of Arizona's comprehensive GIST program trains students in the advanced skills to take up geographic-information related positions across the wide range of industries employing these professionals. The program is designed for students with both limited and advanced skills in geographic information science and technology. The program does not require a graduate record exam (GRE) and it can be completed in as little as 12-months or over a longer-period of time through part-time online enrollment.

Career Paths

The geospatial jobs market is considered a high growth area by the US Department of Labor. Skilled professionals can find a variety of positions. Our students go on to work in business, government, nonprofit agencies, and/or work at universities as researchers. If you are interested in the types of positions obtained by our students upon graduation check out our news stories which dates back to the beginning of the program. Also, periodically review our Employment Resources page on our website.

Program Contacts

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Dr. Peter Johnson
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Michael Levengood
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Dr. Shujuan Li
Instructor GIST 602b
shujuanli@email.arizona.edu

Dr. Chris Lukinbeal
Instructor GIST 601a, GIST604a
chris.lukinbeal@arizona.edu

Dr. Fernando Sanchez
Online Instructor
Fernandosanchez@email.arizona.edu

Dr. Willem van Leeuwen
GIST 601b
leeuw@cals.arizona.edu

See biographies and full contact information in our Faculty and Staff Page

Getting Connected

Online Student Account (NetID)
Your UA NetID is your personal identifier for a number of online services at the University of Arizona. Some of the services requiring a NetID include:

- E-mail and UITS computing accounts (CatMail, UAConnect, HPC, VPN)
- UAccess applications (Student, Employee, Analytics, etc.)
- D2L – a web-based course management system used in 700+ courses on campus
- UA Box – file storage utility for students and staff
- University site-licensed software
- OSCR computer labs
- UA Alert - **UA Alert** is a service that allows registered users – including University of Arizona students, faculty and staff – to receive emergency alerts on their cell phones or other mobile devices during a campus emergency

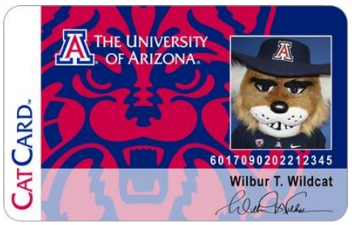
For more information visit the UA's NetID resource page.

Email Account (CatMail)
Student email at the University of Arizona is called "CatMail". Students at the University of Arizona are automatically given a CatMail email account when creating their NetID: netid @ email.arizona.edu. If you prefer, you can also send and receive email using netid @ catmail.arizona.edu. It will access the same account. This email address is the official means of communication between the University and its students. This email account will also be necessary to send emails to the MS-GIST class Listserv, a facility used for keeping students apprised of in-class activities, extracurricular activities, internship/job notices, questions on class material, and just about anything that pertains to the MS-GIST program. **For this reason, you must check your CatMail account regularly to stay up to date with announcements and communications that are crucial to your coursework in the program.** Make sure that you enable email forwarding if you regularly use a different email account.
For additional information about CatMail, visit uits.arizona.edu/faq/catmail

University Identification (CatCard)
Along with your NetID and CatMail accounts, you will need to obtain a CatCard once you are on campus. The CatCard is connected to many resources on campus, including Bursar Account access, UA Library materials checkout, Campus Recreation, Arizona Athletics, and after-hours building & room access, among other important functions. Be sure to get your CatCard as soon as you can once you arrive on campus, as access to most university resources requires it. After-hours building access to ENR2 and our classroom requires a CatCard programmed for access.

Online students are not required to get a CatCard unless they plan on using on-campus resources.

For more information on the CatCard and how to get yours, please visit catcard.arizona.edu



Maybe, just maybe,
your CatCard will look
THIS awesome!

D2L (Desire2Learn)

D2L is the first stop for course information, content, grades, and discussion in the MS-GIST and Professional Certificate program. D2L is an online set of tools that allow an instructor to accomplish instructional goals that are difficult in a face-to-face setting. It can be used for any course whether it is primarily face-to-face, completely online, or anything in between. A D2L course site allows "anytime, anywhere" access to syllabi, course readings, multi-media files, electronic dropboxes for assignment submission, online quizzes, grading, and more. To access your D2L courses visit the D2L login page. You will need to provide your NetID and Password for access.

UA Box

Once you begin the program, you may require cloud access to data. The system we will be using to host this sort of data (if you wish) is called UA Box. This service hosts MS-GIST student data in a place that is easily accessible, whether you are physically at the University of Arizona, or are anywhere in the world (with an internet connection). The service is also a good storage place for documents: UA Box allows you to store up to 50GB of data on its servers. UA Box is an excellent option for data storage, so it is important that you are set to go with it by the time GIST 601 begins. Feel free to store your coursework documents on UA Box, too.

To get started with this service, please visit the Box@UA page. Click the link "Log in to UA Box", click Continue on the "Part of the University of Arizona" screen, and you will be prompted to use your NetID and password to gain access to the application. Once you successfully log-in, you will not have any folders or data. Once the curriculum gets rolling in January, we will begin to share folders of data with you so that you can explore it and use it to complete lab assignments.

MS-GIST Listserv (In-person)

The MS-GIST Listserv is one of the primary methods used for instructors, faculty, and staff to communicate with students—and for students to communicate with their classmates. Many important emails regarding class assignments, announcements, jobs & internships, and deadlines are sent via this Listserv. More information regarding GIST Listserv signup (and other useful listservs) will be provided on the first night of class.

Stay Connected with GIST Social Media
Besides being connected to the MS-GIST Program through the class listserv and nightly class meetings, students should stay apprised of everything going on with the University of Arizona GIST Programs by keeping an eye on our many media outlets. These are great sources to keep in the know for news, events, and internship/job openings that might be of interest to students and the southern Arizona GIS community.

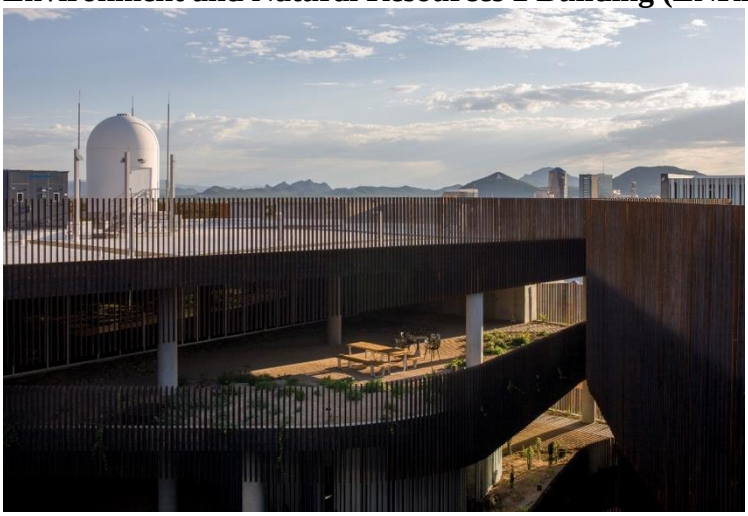
GIST Main Website: gis.arizona.edu
GIST Facebook Page: facebook.com/uagist ("Like" the Page!)
GIST YouTube Channel: youtube.com/channel/UC40xdZJC8F5xD0otobco0oQ
GIST LinkedIn Page: linkedin.com/in/uagist
GIST Twitter: https://twitter.com/uagist
GIST Slack: https://uagist.slack.com/messages/CBJS0RP5J/

Departmental Governance and the GIST programs
The GIST programs are housed within the School of Geography and Development. All students in GIST programs and certificates are represented by the School's graduate student association, SAGA (Southern Arizona Geographers Association). SAGA's main goal is to provide a forum for graduate students to voice their concerns about professional development, the School, or teaching experiences. Many activities are also geared towards encouraging social interaction among the graduate students.

With the broad diversity in research interests and backgrounds, it is important for all of the graduate students to have an opportunity to share their views and to develop lasting relationships that will not only carry them through their years at Arizona, but also through their careers. Intramural teams are often sponsored by SAGA, for example, as is an annual campout during the fall semester. The development of School t-shirts is also handled by SAGA. Other student organization activities have included the 1st Annual Western Geography Graduate Student Conference in 1997 and an Invited Guest Speaker Program. A representative of SAGA is also present at School faculty meetings.

Course Logistics for Students

Environment and Natural Resources 2 Building (ENR2)



The location where all in-person MS-GIST classes take place is known as the ENR2 Building. Designed to look like a slot canyon and echo our sense of place in the desert Southwest, the building exemplifies the University's commitment to environmental sustainability, incorporating energy efficient heating and cooling systems, rainwater harvesting and low-flow faucets, and other innovative architectural solutions in a desert landscape.

Completed in summer 2015, ENR2 includes offices, classrooms, auditoriums, gathering rooms for public programs, and a (planned) rooftop garden. We share the five-story structure with the Institute of the Environment, the School of Natural Resources and the Environment, and some divisions of the Department of Mathematics. The building itself incorporates cutting-edge technologies that epitomize the UA's commitment to sustainability in higher education. Check out more building information here: http://enr2tour.arizona.edu/. The building is located at 1064 E Lowell St, Tucson, AZ 85719. Take a look sometime, especially when there is a rain storm to see the excellent water harvesting features, or when a good sunset is on the horizon! Elevators are located in the northwest corner of the building for access. Multiple staircases are also available.

Spatial Analysis Laboratory (SAL) – ENR2 S547

All in-person MS-GIST classes will convene in the Spatial Analysis Laboratory (SAL) Monday-Wednesday nights 6:00pm-9:00pm, unless otherwise instructed. The SAL is located in the ENR2 Building, in the southeast portion of the building, on the 5th Floor, in Room S547. This computing lab is home to 35+ computing workstations containing all of the software needed to complete MS-GIST coursework. Each workstation has one widescreen monitor and computer running Microsoft Windows 7 on an i7 Intel Processor with 32GB of RAM. These computers are built with our students in mind: they are fast and able to accommodate high-demand software and processes. In addition, students will be able to print documents from inside the lab.

MS-GIST students are welcome to utilize the SAL whenever other classes are NOT being held. A SAL schedule will be posted on the bulletin board next to the SAL each semester, letting students know when they can have "open lab" time to perform analysis. 24/7 access to the SAL will be made available to all MS-GIST students via CatCard entrance.

Major's Lab – ENR2 S545

Outside of class periods or "open lab" time in the SAL, the SGD Major's Lab is open for students to utilize 24/7. 12 workstations are present in this laboratory, two of which are Apple Product workstations. Printing is available in this lab and each workstation has the same programs available for use as the SAL classroom. If a particular software is not currently installed on a workstation in the Major's Lab, please submit a TicketDog request to make sure the required software is installed. Access to this lab outside of normal building operating hours requires encoded CatCard access.

Software

The MS-GIST Program provides all course-related software on Spatial Analysis Lab (SAL) and SGD Major's Lab computers. Our staff recognizes, however, that most students will also need access to certain applications on their home computers in order to keep up with coursework. With this in mind, we will provide all students with free 1-year evaluation copies of ESRI software for installation on their home computers. You can download the software and request a license.

Students should also be aware of the software agreements that the University of Arizona Bookstore Technology Department has made with certain companies to offer you software at discounted rates or free of charge. Each student at the University of Arizona is entitled to one free digital copy of Microsoft Office 365, which includes Word, Excel, PowerPoint, and more. For more information on this offer, navigate to the UA Bookstore. In addition, software packages such as SAS and SPSS can be purchased by students on a University of Arizona license.

Online Students

All courses in the online MS-GIST degree are delivered fully online using the Desire2Learn (D2L) learning management system. Students completing this degree are not required at any time to be present on the University of Arizona physical campus. The facilities and on-campus resources described above can, however, be accessed by online students who live in or near Tucson or plan to visit campus. To arrange access to the Major's Lab or the SAL, please contact Dr. Fernando Sanchez. All required software for online courses can be installed on a student's personal computer through the University of Arizona Software Licensing (https://softwarelicense.arizona.edu/). Instructions for installing required software will be provided during the first week of each course. Online students are strongly encouraged to use Windows-compatible PCs instead of Mac computers, as ESRI software does not run on Macs. However, it is possible to run Windows on a Mac using the Boot Camp software.

Financial Assistance and Scholarships

The first source for financial aid is through the Office of Scholarships and Financial Aid. For U.S. residents, make sure that you file a Free Application for Federal Student Aid (FAFSA. Apply as early as possible for Financial Aid and make sure your funding is spread

across the entire year, including summer. Always sign up for "work study" on your FAFSA. This allows you to pursue employment on campus and your pay is subsidized by the federal government.

Internships (In-Person MS-GIST Only)
The GIST Program has developed strong partnerships with the Arizona GIS community. Each year we receive requests from government, academic, and private entities to host our students to generate, organize, visualize, and/or publish GIS data for their company goals. Students are able to secure paid/unpaid internships/positions that commonly turn into something much bigger that can jumpstart a career or add to an already robust resume.

In the Spring semester, GIST staff will begin to let students know about internship possibilities that are available. Internship notifications will also be advertised on the MS-GIST Listserv throughout the year. Students in our program have served internships with the following government/private entities: USGS; Freeport-McMoRan; the Arizona Geological Survey; Pima County; the City of Tucson; the Sky Island Alliance; and Saguaro National Park, among many others. Whether you are interested in transportation networks, hydrological modeling, species suitability analysis, or emerging technologies (among many other topics), chances are very good that you can land an internship that will enhance your experience with the MS-GIST Program and grow your skills and network to make the next big jump in your career trajectory.

Conferences
Class education is only part of the philosophy in the MS-GIST Program; student participation and exploration in the GIS community is a major component in student success during and after our program. Students are encouraged to attend GIS-related conferences whenever possible during their time in the MS-GIST Program. There is a wealth of knowledge and networking contacts to be gained outside of the walls of the ENR2 Building. This is why we strongly encourage MS-GIST students to travel to San Diego, California for the ESRI User's Conference, and to make the trip to Prescott, Arizona for the Arizona Geographic Information Council Conference (AGIC) in September each year. These are both excellent opportunities for students to learn what duties professionals in the field of GIS perform, to be exposed to emerging technologies in the field, and to also make contacts with students, scholars, and professionals that may share similar interests or goals. Interested students can apply for the ESRI Student Assistantship Program to receive reduced attendance cost for providing logistical support during portions of the conference. For the AGIC Conference, students can apply for the Tony Gonzales Scholarship, which grants recipients free registration, lodging, and meals at the conference. More information will be available regarding these opportunities 1-3 months before the events.

These are the main two conferences that we encourage students to attend, but there are many other conferences and conventions that students can choose to travel to, including the ESRI Developer's Summit, the American Society for Photogrammetry and Remote Sensing (ASPRS) Conference, the annual meeting of the American Association of Geographers (AAG), and others. Students miss out on valuable opportunities if they do not attend conferences and meetings.

Local Meetups
In addition to conference attendance, students are encouraged to take part in local GIS and Geography meetups. The University of Arizona continually has an array of different meetings, seminars, and discussions that may be of interest to students. Each Friday, the School of Geography and Development holds an afternoon colloquium that attracts notable geographers and scholars from around the world to speak about their research. Once a year the GIST group will sponsor a special guest colloquium speak focused on geographic information science. Following colloquium meetings, attendees often retreat to a local establishment to continue the discussion.

The second Friday of each month is marked by the meeting of the Tucson Area GIS Cooperative. This group is composed of GIS users, developers, managers, and interested parties from across southern Arizona. Meetings include short talks from professionals detailing recent research, demonstrating technology adopted for certain projects, or discussing new developments in the realm of GIS. This is a very welcoming, intelligent group of individuals who are receptive to newcomers to GIS, or seasoned professionals. MS-GIST students are strongly encouraged to attend Cooperative meetings when possible. The Cooperative also hosts a GIS Fair in Downtown Tucson on the first Friday in November. This event brings several of southern Arizona's GIS-utilizing entities to discuss their work and projects in one location.

Each year, the MS-GIST Program and Pima County GIS Cooperative also hosts an ESRI Developer's Meetup. This is an additional opportunity for students to become acquainted with GIS professionals in the Tucson area, and to also learn about how some of these professionals are including ESRI developing tools and APIs to meet project goals, streamline workflows, and/or enhance visualization of data. This event is usually held in November.

Online students who live in or near Tucson or plan on visiting the University of Arizona campus are welcome to participate in these events.

Technology Contacts and Troubleshooting

The MS-GIST Program utilizes a number of different computer programs and software packages. During your time spent in the program, it is likely that you will run into some sort of technological issue, whether it occurs on your personal computer or on a laboratory computer. The following resources and contacts will guide you to the successful solution to your problem.

For MS-GIST Program issues (lab equipment problems, software issues, etc.):

UA TicketDog System
The College of Social and Behavioral Sciences uses the TicketDog system to resolve technology problems. If you observe any significant issues with laboratory computers or need access to software that is currently unavailable for use, utilize this system to notify department technicians/analysts of the issue. Analysts typically respond to requests within 24 hours.

To submit a TicketDog request, follow these instructions:

- Navigate to TicketDog. Enter your NetID in order to place the work order request.
- Click the "Labs/Off-Campus Equipment" button.
- Fill out the necessary information, and be sure to enter very specific information, most importantly the computer that is having the issue regarding your request to make sure that the analyst is clear about what is required. If the analyst has any questions regarding your request, they will contact you by email.

Please notify Chris Lukinbeal prior to submitting a TicketDog request for a SAL machine.

The lead SBS Tech for GIS is:
Tawny Lochner, Geographic Information Systems Analyst
tawnyl@email.arizona.edu

For General Computing Issues: UITS 24/7 IT Support Center

The 24/7 IT Support Center is the first point of contact for many IT applications and services at the University of Arizona. UITS is available seven days per week (excluding University holidays) and are ready to help address any computer or technical concerns you have. Whether you need help logging into a class or you need a virus removed from your computer, you can contact the team at the support desk for assistance.

Location: Martin Luther King Jr. Building, 1322 E. 1st Street
Phone: 520-626-8324

Parking and Transportation Services

Depending on where you live in Tucson during the MS-GIST Program, there are multiple options to get to and from campus:

Walking: free and good exercise.

Bicycling: also, free, good exercise, and Tucson has invested a lot in bike infrastructure. Be sure to buy a U-Lock and possibly a cable as well to secure your bike; no bikes are allowed inside University buildings. Register your bike with Parking and Transportation Services, and see more campus bicycle information. There is also a FREE bike sharing program on campus called Cat-Wheels.

Tucson has a new city bike share program called tugo. Tugo requires a phone app, and has daily, monthly ($18), and annual ($80) pricing. There is a tugo bike share station on the northeast corner of ENR2.

UA Cat Tran: The Cat Tran serves students with on campus and off campus routes. You can track the Cat Tran buses in real time using this web mapping application!

SunTran and SunLink Public Transportation: SunTran is the Tucson's public bus system. The SunLink is the fully-electric street car system that runs from University Medical Center, through downtown Tucson, to the west side of the Santa Cruz River. UA students can buy subsidized passes to access the streetcar and bus lines.

Parking: for students preferring to park on campus, you can purchase a pass for any parking garage or zone that has parking passes available. Because all classes will be held in the ENR2 Building, it would be wise to pick a parking area near the building. The South of Sixth lots, Sixth Street Garage, and Lot 5072 are the nearest options.

Note: most surface lots are open for free parking after 5:00pm. If you do not plan to be on campus until after 5:00pm on most days, park at a meter or pay for garage parking on days that you do need to be on campus earlier, or find free curbside parking on or south of 8th St.

For more information on parking at the University, navigate to https://parking.arizona.edu/parking.

Safe Ride
SafeRide is a free transportation service for University of Arizona affiliates. Since 1981, SafeRide has provided a nighttime alternative to walking alone on campus and in the Tucson community. It is managed and operated entirely by students under the sponsorship of the Associated Students of the University of Arizona (ASUA). As an academic service, SafeRide's mission is to serve those going to or from campus, while also providing a friendly and official presence on the streets at night.

To schedule a ride, call 520-621-SAFE (7233) or use the TapRide app.

Academic Resources for Students

Writing Assistance & The Writing Center Online
The Writing Center assists with improving the quality and your confidence in writing. Online Writing Center Tutoring is available.

Learning Disabilities
If you anticipate barriers related to the format or requirements of this course, please contact Chris Lukinbeal or any MS-GIST staff member so that we can discuss ways to ensure your full

participation in the course. If you determine that disability-related accommodations are necessary, please register with the Disability Resources Center and notify Chris Lukinbeal of your eligibility for reasonable accommodations. We can then plan how best to coordinate your accommodations.

Disability Resource Center • 1224 E. Lowell Street • Tucson, AZ 85721
Phone: (520) 621.3268 • Fax: (520) 621.9423
uadrc@email.arizona.edu

Career Services
Prepare for Your Career!
It is never too early or too late to begin planning your career and academic plan. The University of Arizona Career Services offers assistance with resume writing, interviewing, and tools for your job search. Taking time to explore the Career Services is well worth it!

Career Services 1303 E University Blvd., Suite 411, Tucson, AZ 85721
Phone: (520) 621.2588

University of Arizona Libraries
The University of Arizona Libraries advance the University's mission and priorities through the active contributions of knowledgeable staff who choose cost effective methods of acquiring, curating, managing, and connecting customers to information services and resources and providing education in their use.

University of Arizona Geospatial Data
During the past few years, the University of Arizona has realized the importance of collecting, maintaining, and making geospatial data available to students, staff, and affiliates. This recognition sparked the creation of the GIS and Geospatial Data website, which features data from Arizona, Mexico, the United States, and globally. This is an excellent resource for students to utilize when searching for datasets.

The recent introduction of the Spatial Data Explorer, a geospatial data discovery portal, provides broader access to geospatial data and enhanced preview, download, and sharing functionality. This site is a must-visit in terms of data exploration and acquisition.

If you have any questions regarding the Spatial Data Explorer or the GIS and Geospatial Data website, please contact Christine Kollen at kollen@email.arizona.edu or Ben Hickson at bhickson@email.arizona.edu

Graduate Curricula in the MS-GIST In-Person and Online Programs and P-GIST Certificate

The MS-GIST in-person and online degrees are 30-credit hour programs. The P-GIST is a 17-credit hour certificate.

The in-person MS-GIST program begins in January each year. Classes in that program meet Monday-Wednesday evenings from 6pm to 9pm in the Spatial Analysis Laboratory (SAL), ENR2 S547. Students are expected to spend time independently studying class materials and completing coursework. In-person MS classes are 5 weeks long; students take 3 courses during Spring and Fall semesters, and 2 courses during the summer term.

The Online MS-GIST program begins in both January and August each year. Classes are delivered fully online and are 7.5 weeks long. Students take two courses per term.

Required Courses

The MS-GIST degree contains a progression of courses beginning with fundamentals presented in the Spring Semester, to the completion of an original Master's Project at the conclusion of the Fall Semester. Each of the following courses require satisfactory completion in order to be awarded the MS-GIST degree.

The MS-GIST degree consists of 9 courses totaling 30 credit hours. There are no electives for this program. All courses must be taken to graduate. Students must maintain a GPA of 3.0 or higher to receive the MS-GIST degree.

MS-GIST Courses (In-person and Online)

GIST 601A: Geographic Information Science (3 units)
GIST 601B: Remote Sensing Science (3 units)
GIST 602A: Raster Spatial Analysis (3 units)
GIST 602B: Vector Spatial Analysis (3 units)
GIST 603A: Geographic Information Systems Programming and Automation (3 units)
GIST 603B: WebGIS (3 units)
GIST 604A: Applied GIS (3 units)
GIST 604B: Open Source GIS (3 units)
GIST 909: Master's Project in Geographic Information Systems Technology (6 units)

The P-GIST Certificate consists of 6 courses totaling 17 credit hours. There are no electives for this certificate. All courses must be taken to graduate.

P-GIST Courses

GIST 601A: Geographic Information Science (3 units)
GIST 601B: Remote Sensing Science (3 units)
GIST 602A: Raster Spatial Analysis (3 units)
GIST 602B: Vector Spatial Analysis (3 units)
GIST 603A: Geographic Information Systems Programming and Automation (3 units)

GIST 909: Master's Project in Geographic Information Systems Technology (2 units)

Transfer of P-GIST credits to MS-GIST program
All credits taken in the P-GIST certificate can be applied to the MS-GIST degree program. The P-GIST certificate student does need to reapply for MS-GIST program through the Graduate College.

MS-GIST and P-GIST Courses and Description
GIST 601A: Geographic Information Science (3 units)
This course will introduce the fundamental concepts of geographic information systems technology (GIST). It will emphasize equally GISystems and GIScience. Geographic information systems are a powerful set of tools for storing, retrieving, transforming and displaying spatial data from the real world for a particular set of purposes. In contrast, geographic information science is concerned with both the research on GIS and with GIS. As Longley et al. (2001, vii) note, "GIS is fundamentally an applications-led technology, yet science underpins successful applications." This course will combine an overview of the general principles of GIScience and how this relates to the nature and analytical use of spatial information within GIS software and technology. Students will apply the principles and science of GIST through a series of practical labs using ESRI's ArcGIS software.

GIST 601B: Remote Sensing Science (3 units)
This course provides an introduction to the scientific principles and practices of remote sensing. Topics that will be covered in this course include issues of spatial resolutions, the electromagnetic spectrum, remotely sensed sensors, spectral characteristics, digital and digitalization issues, multispectral and LiDAR image processing and enhancement, and land-use and land-cover classifications (LULC) and change detection. The course also emphasizes integration issues and analysis techniques that arise when merging remotely sensed data with geographic information systems (GIS).

GIST 602A: Raster Spatial Analysis (3 units)
This course exams the principles and practices associated with raster data development and analysis, particularly the development of real world surfaces and statistical analysis based on these surfaces. The course is presented in a lecture/laboratory format. The lecture portion will deal with conceptual issues necessary for the use of raster approaches within a GIS framework. The laboratory portion will provide practical experience with rasters in an ArcGIS environment.

GIST 602B: Vector Spatial Analysis (3 units)
This course focuses on providing students with an introduction vector based spatial analysis and their application in GIS software. Students will learn about how to analyze distribution, direction, orientation, clustering, spatial relationships and processes, and how to render analytic

outcomes into cartographic form. This course provides foundational knowledge of global positioning systems, data collection, geodatabase development, and georeferencing.

GIST 603A: Geographic Information Systems Programming and Automation (3 units)
The goal of this course is to gain an introductory understanding of geographic programming and data automation techniques using ModelBuilder and the Python language. Students will become familiar with the ModelBuilder tools inside ArcGIS for Desktop to automate redundant tasks using ModelBuilder and learn how to build a script using Python to customize functionality and task with GIS.

GIST 603B: WebGIS (3 units)
The goal of this course is to gain an understanding of web mapping using applications like ArcGIS for Server, ArcGIS Online (AGOL), WebAppBuilder (WAB), web-enabled geoprocessing, Story Maps, AppStudio, and the Javascript API.

GIST 604A: Applied GIS (3 units)
A GIST-based problem solving approach within the context of a student-directed project. Specific GIS skills covered include project planning, spatial data sources and acquisition, data compilation, coding, analysis, representation, and presentation of results. The course can be repeated for credit, as the topics will vary; each course will examine a different urban or environmental issue in the natural and social sciences using geographic information systems technology.

GIST 604B: Open Source GIS (3 units)
The focus of this class is to examine and apply GIS open source programming. We will examine common languages used like Python, Java, html 5, as well as APIs, JSON, html, and SQL, to automate workflows, extend the tools, and create interactive web and mobile GS platforms. Topics include preparing data as strings, lists, tuples, and dictionaries prior to use, using Python to run SQL queries, working with rasters in Python, automating mapping tasks, and developing custom scripting tools. In addition to weekly assignments and readings, assessment will be oriented around a single, student-directed project that will take the second half of the semester to complete. It will require students to write a simple script to accomplish a specified task in ArcGIS and present the results of their work to peers.

GIST 909: Master's Project in Geographic Information Systems Technology (6 units MS-GIST; 2 units P-GIST)
The Master's Project includes a formal report and presentation submitted in lieu of a Master's Thesis and reflects what a student has learned from the MS-GIST program. This course focuses on addressing normative and/or scientific geographic problems, data capture, compilation and manipulation, and formulating methods and analysis to address the problem in a given timeline.

Master's Project Paper and Presentation
GIST 909 is the Master's Project to be completed by each student at the conclusion of the MS-GIST degree program or at the end of the P-GIST certificate. The Master's Project is completed in lieu of a traditional thesis, and includes two components: a paper detailing project goals, methods, and results; and a public presentation given to an audience preceding graduation. Both the paper and presentation completed for this requirement must be of satisfactory quality as determined by GIST Staff and Faculty. Students will receive feedback from prior drafts of papers and presentations to assist them in achieving quality deliverables by the conclusion of the program. If a student does not provide satisfactory paper and presentation by the end of the program, the degree will not be awarded. If this occurs, the student will consult with GIST Staff and Faculty to determine the next action.

The following must be understood by GIST students regarding the Master's Project:

- The GIST Staff will do its best to connect students with academic and professional assistance with Master's Projects, but it is ultimately the student's duty to provide an excellent final product by the specified deadline.
- Students must abide by deadlines leading up to completion of their Final Projects or will incur deductions for late submissions. This will affect the final GIST 909 course grade.
- GIST 909 is considered independent study wherein students work on their own, under faculty advisor guidance, to complete a project showing the skills they have acquired during the program or certificate.

Transfer Credits from another Institution
Due to the structure and requirements of the certificate and program, no transfer credits will be accepted to substitute for completion in any course in this curriculum.

Satisfactory Academic Progress
To complete the MS-GIST degree, satisfactory academic progress must be maintained and achieved throughout the sequence of the curriculum. "Satisfactory academic progress" will be assessed through three main methods: graded coursework; student assessments; and successful completion of the GIST 909 Master's Project Paper and Presentation. If any of these requirements are not met by the student, the degree will not be awarded until deficiencies are corrected and the student's progress is in accordance with University regulations.

Coursework Grading
Each GIST course will be composed of a series of hands-on assignments, quizzes, oral and written presentations, examinations, and/or projects. Depending on the particular course offering, requirements thereof, and course instructor, assignments will be weighted differently according to subject-matter importance and anticipated completion time. The faculty of record assign final grades in a course. Detailed information on grading will be provided in each GIST course syllabus.

Grade Posting
Official course grades will be posted to UAccess within two business days of the last listed day of class. Please see the UA Academic Calendar for semester and session dates.

Grade of "Incomplete"
In the event that not all assignments are completed by a student by the end of a course in the MS-GIST Program (e.g. GIST 601), it may be necessary to receive an "Incomplete" (I) grade. University policy regarding a grade of "Incomplete" states that students have a maximum of one calendar year to remove a grade of "Incomplete". If the course is not completed within one year, the "Incomplete" grade will revert to an "E", or failing grade. In this case, the student would not be awarded the degree. Please view the Graduate College policy on "Incomplete" grades.

Academic Probation
The MS-GIST Program follows the Graduate College policy on academic probation:

1. Students are required to maintain a GPA of at least 3.00 (B average). If student GPA falls below 3.00, they are immediately placed on academic probation. Students placed on academic probation must meet with Instructional Staff to plan a course of action.
2. Students on academic probation for two consecutive courses are removed from the program or certificate by the Graduate College. Such students must re-apply to the Graduate College for full readmission.
3. Students must maintain a 3.00 average in their graduate course work. A 3.00 average is also required for graduation from the program.

Please view the Graduate College webpage on Academic Probation for more information.

Professionalism in Program
The GIST programs and certificate are designed for working professionals, recently graduated students, and anyone seeking to learn and apply GIS technology in the professional world as a career. We do our best to accommodate students who may have time-consuming obligations.

This program also strives to instill a professional environment for students who will eventually (if have not already) join the professional workforce. The professional atmosphere has high demands, expectations, and occasionally requires sacrifices for those who wish to succeed.

To this end, GIST students are expected to exhibit professionalism in the form of:

1. **Submission of assignments/deliverables on time.** If submissions are not on time, then the student will incur a penalty—like they would in the workplace. Depending on the lateness of the submission, the penalty will vary.

2. **High quality deliverables.** Students should take pride in their work and consistently meet or exceed assignment expectations. If deliverables are noticeably lacking in quality or accuracy, the student will be penalized.

3. **Consistent attendance in class.** If a student repeatedly misses class, their grade will be negatively impacted.

4. **Attention to detail.** Misspellings, grammatical errors, improper labels, and other mistakes will be noticed by Instructional Staff and will result in point deductions.

In addition, the following are also forms of professionalism we expect to observe in the program:

5. **Communication etiquette.** Any instances of improper use of language or poor communication skills with GIST faculty and staff may impact student final grades. In addition, use of the listserv will be monitored by MS-GIST faculty and staff.

6. **Respect students, staff, and faculty.** Any instances displaying disrespect to any classmate, MS-GIST Staff member, or Faculty member will result in negative grade impact.

Switching Degree Programs: Online and On Campus
In some cases it may be possible or necessary for a student to transfer from the In-Person MS-GIST program to the Online MS-GIST program. Certain aspects of these two programs can be interchangeable and allow for students to complete coursework that they may not have been able to complete. Arrangements for this to occur are handled on a case-by-case basis, and require legitimate reason for this action to occur.

Student Appeal Policy
If a student wishes to appeal any of the aforementioned requirements the appeal should be made in writing to the GIST Director. The appeal will be reviewed by the program faculty and may include a collective meeting with the student. The GIST Director will consult with the Director of the School of Geography on appeals and a decision will be rendered.

University Policies for Students
Graduate students at the University of Arizona are required to know about policies related to them. Important links to policies can be found in syllabi and from these links below:

- **Graduate College** (from here students may access Graduate College policies, contacts, information about resources, deadlines, and other useful information): http://grad.arizona.edu/
- **Professional development**, for health and wellness, etc.: http://grad.arizona.edu/new-and-current-students
- **General catalog** http://catalog.arizona.edu/
- **Academic integrity**: http://deanofstudents.arizona.edu/codeofacademicintegrity
- **Responsible Conduct of Research:** http://www.orcr.arizona.edu/

Advising, Mentoring, and Coursework Assistance
It is the charge of the MS-GIST Faculty and Staff to provide as much support to students as possible during the one year program. To accomplish this, we have different methods for students to obtain the assistance that they need.

Advising
From the beginning of the year to the Master's Project, students will occasionally require guidance from MS-GIST program staff. Advising needs in this program can be met by contacting the following members of the MS-GIST Staff or by visiting their office hours.

Dr. Chris Lukinbeal
Director
chris.lukinbeal@arizona.edu
Phone: (520) 621-6181

Dr. Gary Christopherson
Faculty
garych@casa.arizona.edu
Phone: (520) 621-6267

Please be aware that emails sent to these recipients may not be immediately answered. Allow for up to 48 hours for Staff to reply to emails, or visit Staff in person to address advising needs. Limited weekend assistance will be available by email.

Mentoring
MS-GIST faculty and staff will attempt to connect students with knowledgeable academics and professionals when possible to guide students in coursework, Master's Projects, and industry knowledge. Mentors will be available to answer questions and suggest methods, courses of action, and/or additional contacts. Note, however, that mentors are not meant to meet with students on a daily basis: these scholars and professionals have work of their own to accomplish. Students should exercise respect and understanding when attempting to obtain assistance from mentors.

Coursework Assistance
Laboratory assignments and related coursework will prompt questions requiring assistance. It is the duty of the Course Instructor, Instructional Specialist, and Teaching Assistants to address these questions. During open lab time after lectures, these members will be present to discuss assignment issues with students. During this time students are strongly encouraged to ask questions regarding assignments. Open-lab instructional assistance will only be available until 9:00pm on class nights unless special arrangements are made with a student in advance of class. Faculty and staff will hold posted office hours to further work out assignment problems that students may be encountering.

Spatial Analysis Laboratory (SAL) in the ENR2 Building

Advancement to Candidacy
Upon completion of the MS degree coursework, Master's students become Master's Candidates. This change in status allows students to register for 1 unit of 909 rather than 3 units, which is financially beneficial. We suggest that students apply for Advanced Status if they are doing the 16-month in-person MS program or the 2-year online MS program. Additional pertinent enrollment policies that relate to graduate assistantships can be found in the UA Catalog.

Program Costs and Typical Schedules

The MS-GIST programs and PGIST certificate carry a cost of $820 per unit. The MS programs require 30 units of coursework, and the PGIST certificate requires 17 units of coursework. In addition to tuition, fees to support GIST-specific equipment and staffing as well as broader University functions.

Timeline to MS-GIST Degree or P-GIST Certificate
The typical time to degree for the in-person and online MS programs differs, with the online program typically taking 2 years (5 terms) to complete and the in-person program taking 16 months (4 terms) to complete. Our degree programs can be accomplished on accelerated timelines, which are illustrated below. In-person classes run for 5 weeks each, while online classes are 7.5 weeks long. For that reason, the in-person MS program schedules 3 classes per semester (2 in the summer term), while the online program can only schedule 2 classes per term (including summer).

To complete the in-person MS program in 12 months requires students to begin their Master's Project during the break in coursework in May, and to continue to work on the project while simultaneously taking coursework. The accelerated schedule for the online MS program requires taking 4 courses per semester, which represents 36-48 hours of coursework per week, and is not appropriate for students who are employed or have other responsibilities. Online MS students have the option of accelerating their program to 12 months or 16 months. P-GIST students can accelerate their certificate program to 9 months by taking 3 courses per term.

In-Person MS-GIST

AZ Resident Estimated Program Cost	Spring	Summer	Fall	Spring	16-Month Program
Tuition	$5743.00	$2844.00	$5743.00	$820.00	$15,150.00
University Fees	$513.05	$175.41	$513.05	$95.55	$1,297.06
Program Fees**	$900.00	$600.00	$1,400.00	$100.00	$3,000.00
					TOTAL: $19,447

Non-Resident Estimated Program Cost	Spring	Summer	Fall	Spring	16-Month Program
Tuition	$15,718.00	$2844.00	$15,718.00	$1,746.00	$36,026.00
University Fees	$513.05	$175.41	$513.05	$95.55	$1,297.06
Program Fees**	$900.00	$600.00	$1,400.00	$100.00	$3,000.00
					TOTAL: $40,323

Online MS-GIST

Estimated Program Cost	Term 1	Term 2	Term 3	Term 4	Term 5	24-Month Program
Tuition	$4920	$4920	$4920	$4920	$4920	$24,600
University Fees	$50	$50	$50	$50	$50	$250
						TOTAL: $24,850

Online P-GIST

Estimated Program Cost	Term 1	Term 2	Term 3	12-Month Program
Tuition	$4920	$4920	$4920	$14,760
University Fees	$50	$50	$50	$150
				TOTAL: $14,910

The In-Person MS-GIST schedule
Spring Semester Start Only

1 Year Schedule

Spring	Summer	Fall
GIST 601A	GIST 602B	GIST 603B
GIST 601B	GIST 603A	GIST 604A
GIST 602A		GIST 604B
		GIST 909

16 Month Schedule

Spring	Summer	Fall	Spring
GIST 601A	GIST 602B	GIST 603B	GIST 909 (1 unit)
GIST 601B	GIST 603A	GIST 604A	
GIST 602A		GIST 604B	
		GIST 909 (5 units)	

***Advisor will help determine which schedule is best for a student**

The Online MS-GIST schedule

2 Year Schedule
Fall Semester Start

Fall	Spring	Summer	Fall	Spring
GIST 601A	GIST 602A	GIST 603A	GIST 604A	GIST 909
GIST 601B	GIST 602B	GIST 603B	GIST 604B	

Spring Semester Start

Spring	Summer	Fall	Spring	Summer
GIST 601A	GIST 602A	GIST 603A	GIST 604A	GIST 909
GIST 601B	GIST 602B	GIST 603B	GIST 604B	

1 Year Schedule

Fall Semester Start

Fall	Spring	Summer
GIST 601A	GIST 602A	GIST 909
GIST 601B	GIST 602B	
GIST 603A	GIST 604A	
GIST 603B	GIST 604B	

Spring Semester Start

Spring	Summer	Fall
GIST 601A	GIST 603A	GIST 604A
GIST 601B	GIST 603B	GIST 604B
GIST 602A	GIST 909 (3 units)	GIST 909 (3 units)
GIST 602B		

The P-GIST schedule

Fall Semester Start

Fall	Spring	Summer
GIST 601A	GIST 602A	GIST 603A
GIST 601B	GIST 602B	GIST 909 (2 units)

Spring Semester Start

Spring	Summer	Fall
GIST 601A	GIST 602A	GIST 603A
GIST 601B	GIST 602B	GIST 909 (2 units)

If the student is unable to comply with this timeline for any of the previously mentioned reasons or must take an “Incomplete” grade for a course, they must create a plan of action with the MS-GIST Staff to take the appropriate steps. For more information on this topic, please view the Graduate College Policy on Time to Degree.

Master's Project (GIST 909) Guidelines and Information

University of Arizona Policy
The GIST Master Project class is designated by the University as an "individual studies course." According to the University of Arizona, each Master's Project credit hour is equal to 45 hours of work. Students complete a Master's Project in lieu of a Master's Thesis to obtain their graduate degree from the University.

Grading for the Master's Project follows the University's "alternative grading" matrix:

S (superior), P (pass), and F (fail), I (Incomplete), W (Withdrawal)

A passing grade in 6 units of GIST 909 course work is required to earn the MS-GIST degree. Students receiving a grade of "I" have one year in which to make up their incomplete. If the work is not completed, the grade of "I" automatically converts to a grade of "F". The Graduate College also requires that a student must also be continuously enrolled until they graduate. Students should not sign up for the last unit of GIST 909 until the semester in which they are planning to graduate.

General Information
The GIST 909 Master's Project is required to demonstrate the skills learned during the MS-GIST Program. A project includes a well-written document and a final public presentation.

Your project should accomplish at least one of the following:

- Solve a geographic problem using GIS and the analytic skills learned in the program.
- Create a web or mobile application that highlights the technology skills you learned in the program.
- A combination of the goals above but includes visualizations that seek to show new ways to present geographic data.

A Masters Project can be broken down into the following phases: Project Development, Project Execution, and Project Presentation.

Do not allow this project to sneak up on you at the end of the program. Be proactive and work hard to finalize your ideas, acquire data, and move forward towards completion. The GIST faculty and staff will help but your ultimate success on the Master's Project is contingent on the amount of time, diligence, research, and hard work that **you** put into it.

All deliverables in each phase of your project will be submitted to the appropriate D2L dropbox on the GIST 909 course page.

PHASE I: PROJECT DEVELOPMENT
During Phase I you will work with the faculty and teaching support staff to develop your project idea and narrow your topic. The deadlines during this phase are important in that they set the stage for project execution during the final semester of your degree.

Deliverable #1: Project Proposal
You will submit a 2 page project proposal that includes a summary of existing literature:

- To prepare for your project analysis you should have a decent foundation of what's been done related to your topic and how/if your project idea is of value. Summarize what was learned/the benefit of the methods and outcomes included in the cited literature. This literature summary should start to shape the purpose for your project and paper.
- Provide at least 3 pieces of literature (scholarly, professional, and/or general media) that pertain to your project idea and might help inform or support your methods moving forward. For each resource, summarize the article in 2-3 sentences and describe how it is potentially important to your upcoming project.

Project proposal
Provide a summary of your project that includes the following items:

- project statement (statement of what you plan to measure)
- goals and objectives
- proposed methodology (generally what analysis tools, what geospatial methodology)
- proposed data (where you anticipate getting the data)

Your project proposals will undergo review by GIST faculty and staff. Your proposal cannot be pursued as a project until your GIST advisor accepts your proposal. This could mean that you need to revise your proposal one or more times before you are permitted to move forward to Phase II.

Paperwork and Forms
The following forms are required for program completion, and must be completed for successful graduation. We recommend submitting these forms during the second semester of your program. The forms can be found on UAccess (NetID login) under My Academics → GradPath Forms. Upon submitting these forms, they will route to the School of Geography and Development for approval, and to other offices, units, and personnel as required.

Responsible Conduct of Research Statement
Review the relevant University policies on the Responsible Conduct of Research (RCR) and on Academic Integrity, and click "I Certify" before submitting the form.

Plan of Study
We suggest completing this form in the 2nd or 3rd semester of enrollment. The form will automatically fill in completed coursework and the grades awarded, as well as future enrollment. We advise doing this form in Chrome, as other browsers do not always automatically import grades.

Committee Appointment Form
For this form, select "No Committee," and then search for your preferred advisor. In-person MS-GIST students should put Chris Lukinbeal as a default, unless they are working with other specialist faculty. Online MS-GIST students should list Fernando Sanchez as their advisor.

PHASE II: PROJECT EXECUTION

Phase II is dominated by your actual research, analysis, and writing. While the GIST faculty and staff will offer revisions, edits, and suggestions on your analysis and writing, the responsibility of making progress on this project is dependent on **your** effort put forth during this final component of the program. This should showcase everything that you have learned during the MSGIST Program, and you should take pride in your work on this project: it's possible that your paper and presentation could be a jumping point to the next stage of your career.

A template for your final paper will be provided to you via D2L. You are **required** to use the formatting guide provided for each of the following deliverables.

Be aware that all the deliverables below are processed through a plagiarism filter. Plagiarism will not be tolerated by the GIST programs and against the UA's Code of Academic Integrity.

Deliverable #2: Draft Introduction

After you receive feedback from Deliverable #1, you should begin to work on your introduction section.

- Your Introduction should include a brief overview of the paper including a summary of the background leading to the research question or purpose of the paper.
- *Please note*: for this submission, along with the following deliverables, if the GIST 909 staff deem your writing too difficult to edit, they will return your draft and ask you to revise it more thoroughly on your own and with the assistance of the UA Writing Center. You will resubmit the deliverable after your prior submission has been pre-edited more thoroughly.

Deliverable #3: Draft Introduction and Methods

The methodology section should describe the methodology utilized in the project. This might include the design, study area, participants, and main measurable outcome of the project. It must also provide details regarding sampling, measurement, data collection, and data analysis. If there are any assumptions that you are making in your analysis (conditions that may not be necessarily true in the real world but are adopted in your project to facilitate GIS analysis), these should be included in the Methods section to give the reader context of the analysis conditions.

In addition to generating new text regarding your methods and analyses, you will be expected to incorporate edits and suggestions made by the GIST faculty and staff on your introduction and literature review section. We expect to see improvement with each deliverable submitted.

Deliverable #4: Draft Introduction, Methods, and Results

Based upon the feedback received from your Deliverable #3 submission, you will make revisions to your Introduction and Methods. In addition to those sections, Deliverable #4 will include your project's Results. The results will explain the product of the effort put forth. This should include quantitative findings with appropriate tables and graphics. Every Figure and Table should be sequentially numbered and requires a descriptive caption.

Once again, improvement on the previously submitted sections should be noticeable between this deliverable and prior drafts.

Deliverable #5: Draft Abstract
Your abstract will be a summary of your project that can be quickly read by interested parties to determine if they will dig further into your research. We will provide formatting and guidance on your abstracts prior to this date.

Abstracts must follow the guidelines of the Association of American Geographers (annual conference guidelines, which can be found here.

Deliverable #6: Final Abstract
This will be a finalized abstract that incorporates revisions suggested by GIST 909 instructional team.

Deliverable #7: Draft Paper
Your first full draft should reflect the feedback and edits provided in previous submissions. This will include your final Abstract, Introduction, Methods, Results, and Conclusions. This should be a near-complete draft. The editors will provide feedback and edits related to making sure that thoughts and sections connect, your illustrations are presented appropriately and illustrate what the narrative describe, etc. A more detailed rubric for evaluation will be provided as this deadline nears.

PHASE III: PROJECT PRESENTATION
Phase III is focused on preparing and carrying out the public presentation of your Master's Project. This includes the aesthetics of the presentation medium that you will be utilizing (usually Microsoft PowerPoint) and your ability to orally present your project findings to the public.

Deliverable #8: Draft PowerPoint
This is an opportunity for us to provide feedback on your PowerPoint design, content, and flow. This is a mandatory submission. You will receive edits and suggestions from faculty and staff based on your first effort. If certain changes suggested by staff are not made, your final PowerPoint grade may be lowered. As the final presentation dates near, the GIST faculty and staff will set up time for a quick run through of the slides and provide feedback about the presentation.

Deliverable #9: Final Paper
Your final paper should incorporate edits and suggestions made by the GIST 909 instructional team. If it is determined that your final paper is not deemed satisfactory by this program, you will not be awarded your degree until your paper meets expectations.

Deliverable #10: Final PowerPoint Presentation
Your final PowerPoint should incorporate edits and suggestions made by the MSGIST 909 instructional team. If it is determined that your final presentation is not deemed satisfactory, you will not be awarded your degree until your presentation meets expectations.

WRITTEN REPORT DETAILS

You have the option to archive your Master's Project with the University of Arizona Library. It is expected to be free or grammatical errors when filed. All papers should follow the Annals of the American Association of Geographers guidelines (see: http://www.aag.org/cs/publications/journals/annals, and specifically, Information for Authors, Guide to Preparing Graphics for the Annals, Annals Style Sheet).

Introduction:

- Problem background: How did this issue arise? Is it important to solve this problem for your company or group or for other reasons (does it better our society, business work flow, academic knowledge, etc.)?
- Background about your company or group you worked with to solve this problem.

Thesis Statement (presenting your geographic problem)

- i.e. In this paper I argue that a nuclear waste dump should be located in abandoned mines in Arizona.

Methods

- What steps did you take to solve your problem?
- Outline how the problem was addressed.
- Discuss the basic data issues of the problem: (1) extent of your area (2) theme
- (3) time frame.
- If you are doing field work, make sure to take a camera along so you have visuals for your talk and paper.
- Analysis: what did you do to solve the problem?
- State the spatial analysis method and illustrate it as well.
- i.e., Kriging: state the parameters used in the method (and error values or RMS values as well).
- If you experiment with different methods, state this as well and show why the method you chose worked the best.

Results

- What you found and how you solved the problem (discussion section).
- Accuracy assessment for the problem (if needed).
- Pretty maps designed for print are important.
- One or more final maps that show how the problem was solved.

Conclusions

- How the problem was solved in summary by revisiting the thematic statement (central argument).
- How this might change business practices or other types of problem solving practices.
- New methods discovered: issues learned or revealed during the process (for instance, you may have found a better way to do an analysis by combining multiple analytic techniques).

- If you were to do it all over again, what would you do differently?
- How your project may help solve other unrelated projects.
- If applicable, what future research or "next steps" could be explored to build on your findings during this project?
- Make sure to include a reference section if you consulted any other materials to make this written report. You MUST cite material in the text of the document and then put it in the final reference section.
- Make sure you have someone else read your document before you submit it for the rough draft review and before you submit it for final review.
- As a guideline, we expect these papers to be anywhere from 18-25 pages, not including appendices.

PRESENTATION DETAILS

The presentation will be 15 minutes in length with 5 minutes for questions.

Presentations should have a simple format. What follows here is a general guide to a presentation format, but you do not have to follow it strictly:

- Title Slide (Name of Project, Name of presenter, date of presentation)
- Introduction section: state the geographic problem, technological issue, or visualization issue.
- Where is your study site (show on a map)?
- Provide an outline of what is to come in your presentation
- Methods Section: Explain how you used GIS to solve the problem, technological, analytic or visual. This should include the steps you used to address the problem: BOTH the geographic logic applied and the GIS steps taken to get the data into a format for analysis (but do not get bogged down in the details of data processing unless it is relevant to your analysis).
- Analysis Section: Show what analysis was done to answer the problem. Some of you have been concerned that your analysis was too simple. DO NOT STRESS THIS ISSUE. Always remain confident and positive in your presentation and show us what results you came up with. BUT make sure your results are LIMITED to addressing the geographic problem (DO NOT GO OFF ON TANGENTS, STAY FOCUSED ON ANSWERING THE GEOGRAPHIC PROBLEM).
- Results & Conclusions: State your findings in text, graphic, map form (or some combination of this). Your conclusion ALWAYS begins by stating what the problem was, and then shows your findings.

Make sure that your maps, figures, and tables were created for the medium of PPT.
Make sure to include maps.
Your PowerPoint slides must be set to "Standard" slide size (4:3 ratio).

REMEMBER

Your PowerPoint Presentations will be evaluated using three criteria:

1. How well you answered the geographic problem: This also includes the analytic techniques you deployed to solve the problem.
2. The aesthetic quality of your visual presentation (both the PowerPoint and the Maps)
3. The quality of your OVERALL presentation: This includes the overall flow of the presentation, the quality of the speakers, and the quality of the PowerPoint. Your presentation skills (voice, presence, eye contact) will also be evaluated.

DO NOT FOCUS ON "WHAT WE COULD HAVE DONE" OR "PATHS NOT TAKEN". Always focus on your strengths.

One of my most helpful tips when giving a successful presentation:

"Tell us what you're going to say, say it, then tell us what you said." Remember and master this and your presentations will be excellent.