Masters of Geographic Information Systems Technology (MS-GIST)

and the

Professional in Geographic Information Systems Technology Certificate

Student Handbook

(Last Revised 12/2017)

Table of Contents

Welcome from the Director

As you begin your journey to the completion of a Master's of Science in GIST, you are entering an exciting, growing, and crucially important field. Some of today's most complex and pressing challenges, 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, are acutely spatial questions. 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 sit back, take tests, do lab work, and graduate. Rather, project-based learning is an integral part of this program. Geographic problem-solving along 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. This comprehensive 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 university's 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, do review our Employment Resources page on our website.

Program Contacts

Dr. Chris Lukinbeal
Director, Geographic Information Systems Technology
ENR2 S507
chris.lukinbeal@arizona.edu
Phone: 520-621-6181

Elizabeth Cordova
Program Coordinator, School of Geography and Development
ENR2 S433
elizabec@email.arizona.edu
Phone: 520-621-7486

Course Instructor Contact Information

Dr. Gary Christopherson
Instructor GIST 602a
gchristo@email.arizona.edu

Kyle Hartfield
Instructor GIST 601b
kah7@email.arizona.edu

Dr. Peter Johnson
Instructor GIST 603a, GIST 603b
psjohnso@gmail.com

Michael Levengood
Online Instructor
levengood@email.arizona.edu

Dr. Shujuan Li
Instructor GIST 602b

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: https://gis.arizona.edu/our-faculty-and-staff

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)
- 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

For more information visit netid.arizona.edu

Email Account (CatMail)

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. While the CatCard used to be just a basic identification card, it has evolved into much more in recent years. The CatCard is connected to many resources on campus, including Bursar Account access, UA Library materials checkout, Campus Recreation, Arizona Athletics, and 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 requires a CatCard programmed for access.

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 MS-GIST. 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 d2l.arizona.edu. 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 uits.arizona.edu/services/box. 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

As mentioned briefly earlier, 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 the class. Many important emails regarding class assignments, announcements, 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, and here (put in a forward!): http://uits.arizona.edu/services/catmail?id=2278.

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

Departmental Governance and the GIST programs
The GIST programs are housed in the School of Geography and Development. All students in GIST programs and certificates are represented by the Southern Arizona Geographical Association (SAGA) is the School's graduate student 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 represented at School faculty meetings.

Course Logistics for Students

Environment and Natural Resources 2 Building (ENR2)

The location where all MS-GIST classes take place is known as the ENR2 Building, or as some have come to call it, "The Canyon". Designed to look like a slot canyon and echo our sense of space in the 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 rooftop community 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 classes will convene in the Spatial Analysis Laboratory (SAL) Monday-Thursday 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 of this lab.

MS-GIST students are welcome to utilize the SAL whenever other classes are NOT being held. A SAL laboratory 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 card entrance at the north SAL door. Access to this lab on the weekends (and the Major's Lab room, below) requires CatCard-enabled access and a Room Permissions card.

Major's Lab – ENR2 S545
Outside of class periods or "open lab" time in the SAL, the 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 lab. 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 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 1-year evaluation copies of ESRI software for installation on their home computer absolutely free of charge. Students will receive evaluation copies for the current version of ArcMap in early Spring. You can download the software and request a license here: softwarelicense.arizona.edu/esri.

Students should also be cognizant 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 this web address: http://uabookstore.arizona.edu/technology/campuslicensing/default.asp. This is an incredible opportunity for students. In addition, software packages such as SAS and SPSS can be purchased by students on a University of Arizona license. More information on these and other applications here: http://uabookstore.arizona.edu/technology/stulicense.asp.

Financial Assistance and Scholarships
The first source for financial aid is through the Office of Scholarships and Financial Aid (http://financialaid.arizona.edu/). For U.S. residents, make sure that you file a Free Application for Federal Student Aid (FAFSA, http://www2.ed.gov/offices/OSFAP/DirectLoan/applying.html). 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 (MS-GIST In Person 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 work with 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.

Once the Spring semester gets into full-swing, GIST Staff will begin to let students know about different internship possibilities that they can apply for. Internship notifications will also be advertised on the MS-GIST Listserv throughout the year. We receive internship inquiries from entities dealing with an array of different topics. Previous 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
Students are encouraged to attend GIS-related conferences whenever possible during their time in the MS-GIST Program. 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. 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, and others. Students that do not attend any conferences are missing out on valuable opportunities.

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 (recent colloquium speakers and topics, https://geography.arizona.edu/colloquium). 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.

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 many different technology problems within participating departments. If you observe any significant issues with laboratory computers or need access to software that is currently unavailable for use, you will 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 this website: http://ticketdog.arizona.edu. You will be prompted to access your NetID account 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 the Chris Lukinbeal prior to submitting a TicketDog request.

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. The IT staff is available seven days per week (excluding University holidays) and are ready to help address any computer or technical concerns you have. They want to make sure that you are prepared to pursue your University of Arizona degree. 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.
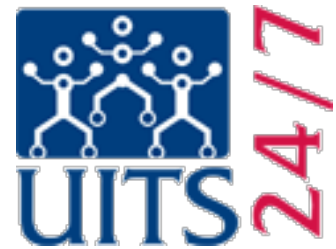
Location: Martin Luther King Jr. Building, 1322 E. 1st Street
Phone: 520-626-8324

Parking and Transportation

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 areas on and near campus have pretty good bike paths/routes/roads for this mode of transportation. 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 here. There is also a FREE bike sharing program on campus which you can find out more about here.

UA Cat Tran: The Cat Tran serves students on campus as well as some areas off campus. See more information here: https://parking.arizona.edu/campus-services/cattran/.

SunTran and SunLink Public Transportation: The SunTran is the public bus line that has a travel system across Tucson. The SunLink is the newly minted fully-electric street car system that runs from University Medical Center to Downtown Tucson. For student subsidized passes to access these services, navigate to https://parking.arizona.edu/transportation/.

Parking: for students that prefer 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 (South of Sixth, Sixth Street Garage, and Lot 5072 are the nearest options; see maps at this link. See the Parking and Transportation website for available 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, you could probably get away with not purchasing a pass and parking at a meter or pay for garage parking on days that you do need to be on campus earlier.

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

Be aware that most of these parking and transportation options require a CatCard for permit/pass purchase.

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.

Call us at 520-621-SAFE(7233)! http://azsaferide.wixsite.com/saferide

<div align="center">

Academic Resources for Students

</div>

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. For more information go to http://thinktank.arizona.edu/online-tutoring. In order to access online tutoring during the scheduled times, you will need your NetID and password.

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 Disability Resources (621-3268; http://drc. arizona.edu/) 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
career.arizona.edu

University of Arizona Library
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.
www.library.arizona.edu

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.
http://libguides.library.arizona.edu/GIS

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. geo.library.arizona.edu

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 On Campus Program
The MS-GIST is a 30-credit hour program. The P-GIST is a 17-credit hour certificate.

The On Campus MS-GIST section begins in the spring semester only. 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.

Required Courses
The MS-GIST degree is composed of 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.

MS-GIST Courses
GIST601A: Geographic Information Science (3 units)
GIST601B: Remote Sensing Science (3 units)
GIST602A: Raster Spatial Analysis (3 units)
GIST602B: Raster Spatial Analysis (3 units)
GIST 603A: Geographic Information Systems Programming and Automation (3 units)
GIST603B: WebGIS (3 units)
GIST604A: Applied GIS (3 units)
GIST604B: Open Source GIS (3 units)
GIST909: 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
GIST601A: Geographic Information Science (3 units)
GIST601B: Remote Sensing Science (3 units)
GIST602A: Raster Spatial Analysis (3 units)

GIST602B: Raster Spatial Analysis (3 units)
GIST 603A: Geographic Information Systems Programming and Automation (3 units)
GIST909: 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

GIST601A: 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., notes (2001, vii) "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.

GIST601B: 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).

GIST602A: Raster 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.

GIST602B: Vector 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 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.

GIST603B: 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.

GIST604A: 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.

GIST604B: 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 roasters 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.

GIST909: Master's Project in Geographic Information Systems Technology (1-6 units)

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.

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
In order to complete the MS-GIST degree, satisfactory academic progress must be maintained and achieved throughout the sequence of the curriculum. Due to the unique configuration of the MS-GIST program and P-GIST certificate, "satisfactory academic progress" will be assessed through three main methods: coursework grades; assessments; and successful completion of the GIST 909 Master's Project Paper and Presentation. If any of these requirements are not met by the MS-GIST and or P-GIST student, the degree will not be awarded until the time that deficiencies are corrected and the student's progress is in accordance with University regulations.

Coursework Grading
Each MS-GIST course (e.g. GIST 601a) will be composed of a series of hand on assignments, quizzes, oral and written presentations, examinations, and/or projects. Depending on the particular course offering, requirements therein, and instructor of the course, particular assignments will be weighted differently according to subject-matter importance and anticipated time to complete the assignment. Each assignment will be assessed by a Instructional Specialist or Instructor according to weighted components in the assignments. The faculty of record assign final grades in a course. More detailed information on grading will be provided with the syllabus of each MS-GIST course.

Grade Posting
Grades will be posted to the UAccess System at the end of the University semester that the MS-GIST course occurs in. For example, grades for GIST 601 will not be officially posted until the conclusion of the Spring Semester at the University, even though GIST 601 ends in March. However, the grades that are present in the D2L System at the conclusion of any given course will typically reflect the same final grades that are reported to the UAccess System. In essence, you will usually know your final grade in a course prior to the conclusion of the University semester.

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", 80% average). If students' 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 "B" average in the graduate course work. A "B" average is also required for graduation from the program.

Please view the Graduate College webpage on [Academic Probation](#) for more information.

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, they will not be awarded the degree. 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 grade of the student.
- GIST 909 is considered independent study wherein students work on their own, under their faculty advisor's guidance, to complete a project showing the skills they have acquired during the program or certificate.

Time to Degree or Certificate Completion

The Online MS-GIST schedule

Fall Semester Start

First Year

Fall	Spring	Summer
GIST601A	**GIST602A**	**GIST603A**
GIST601B	**GIST602B**	**GIST603B**

Second Year

Fall	Spring
GIST604A	**GIST909**
GIST604B	

First Year

Spring	Summer	Fall
GIST601A	**GIST602A**	**GIST603A**
GIST601B	**GIST602B**	**GIST603B**

Second Year

Spring	Summer
GIST604A	**GIST909**
GIST604B	

The In Person MS-GIST schedule
Spring Semester Start Only
1 Year Schedule (5 week classes)

Spring	Summer	Fall
GIST601A	GIST602B	GIST603B
GIST601B	GIST603A	GIST604A
GIST602A	GIST909	GIST604B
		GIST909

18 Month Schedule

Spring	Summer	Fall
GIST601A	GIST602B	GIST603B
GIST601B	GIST603A	GIST604A
GIST602A		GIST604B
	GIST909	GIST909
Spring		
GIST909		

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

The P-GIST schedule

Fall Semester Start

Fall	Spring	Summer
GIST601A	GIST602A	GIST603A
GIST601B	GIST602B	GIST909 (2 units)

Spring	Summer	Fall
GIST601A	GIST602A	GIST603A
GIST601B	GIST602B	GIST909 (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: https://grad.arizona.edu/policies/academic-policies/time-degree.

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 here: http://catalog.arizona.edu/2015-16/policies/grade.htm

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 On Campus MS-GIST section to the Online MS-GIST section. 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 Staff and Faculty 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:

Dr. Chris Lukinbeal
Director
chris.lukinbeal@arizona.edu
Phone: 520-621-6181
Cell: 520-307-2048

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.

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 Teaching Assistants, Instructional Specialist, and the Course Instructor 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. Instructor assistance, Instructional Specialist assistance, and teaching assistance will only be available until 9:00pm on class nights unless special arrangements are made with a student in advance of class. In addition, faculty and staff will have office hours to further work out assignment problems that students may be encountering. Limited weekend assistance will be available by email.

Spatial Analysis Laboratory (SAL) in the ENR2 Building