GGS 422 – **Drone Remote Sensing;** Credits: 3

4:30 – 7:10 pm Monday; Exploratory Hall 2103

August 23, 2021 - December 15, 2021

*“76-100% Face-to-Face Format”*

**Syllabus**

**Objectives**: To educate students on the use of drones to acquire scientific remote sensing data and process various drone-based sensor data sets for multiple applications. The course will involve hands-on experience with drone vehicles, sensors, imagery software and applications.

Gain hands-on experience with drone vehicles, sensors, image processing software and applications. With the proliferation of drones there are increasing opportunities to use drones for scientific remote sensing data acquisition and applications. This advanced course focusses on understanding the fundamentals behind acquiring scientific remote sensing imagery with drone-based cameras (e.g. multi-spectral and thermal) and processing the data for various applications.

**Learning outcomes:**

* Understand how to use drones as a platform to acquire scientific remote sensing data
* Understand components and functions of a drone system
* Understand the photogrammetric principles of drone-based image acquisition and processing
* Participate in application-specific flight planning and data acquisition with a drone
* Develop insight into regulations and qualifications for safe and legal drone operation.
* Understand how to operate various drone-based sensors, RGB camera, Multispectral, Thermal, LiDAR
* Develop the ability to process drone-derived raw data imagery (RGB camera, Multispectral, Thermal, LiDAR) to various products and applications.
* Gain oversight of the complete mission pipe-line, from planning to final product.
* Learn to present research proposals and complete a project as a team member

**Note:**

* Students will not be required to acquire their own data as the data will be acquired by the qualified instructors.
* This course will not lead directly to certification of students for operating a drone.
* The course is not about flying drones, but about understanding how to acquire and process remote sensing data for scientific purposes.

**Prerequisites:** GGS 379, or GGS 412, or GGS 416, or other equivalent remote sensing course.

**Instructors:** **Dr. Paul R. Houser** Telephone: 301-613-3782

Office: Exploratory Hall–Room 2209 E-mail: phouser at gmu.edu

Office Hours: by appointment, or before/after class

**Dr. Konrad Wessels** Telephone: 703-993-4238

Office: Exploratory Hall–Room 2203 E-mail: kwessel4 at gmu.edu

**Communication:** Please correspond via email. We shall respond within 24h during the week.

**Recommended text:** Small-Format Aerial Photography and UAS Imagery, ISBN: 9780128129425

**NOTE:** The book is entirely optional, all required materials will be presented in class.

**Procedure:** Material will be covered by lectures, not necessarily restricted to the text/supplemental and handouts. Students are expected to read the text and other assignments thoroughly prior to the lecture.

**Performance:** Material covered on the final exam will include handouts, lecture notes and outside readings.

**Evaluation:** All work must be your own. A grade of "0" will be assigned for any work which is clearly not your own or cheating of any type. Refer to GMU plagiarism policy and definitions.

Homework 25 points (5 per assignment)

Paper Presentation 10 points

Final Exam 25 points

Pop Quizzes 10 (2 Points per quiz)

Drone RS Project 30 points

TOTAL 100 points

Grades are assigned using a ten percent scale (+/- grades determined at instructor discretion):

A= 90 – 100 B = 80 – 90 C= 70 – 80 D= 60 – 70 F= 0 – 60

**Homework assignments:** All assignments should be done neatly and professionally. All homework should be submitted on Blackboard by the due date. The problem should be defined, diagrammed (if appropriate), and the solution should be developed in a step-by-step procedure. Spreadsheet answers can be included. The final solution should be reported to the appropriate significant figures and underlined. You are encouraged to work together in study groups; however, identical (copied) homework will be awarded a grade of zero (0). Incorrect homework may be neatly reworked and resubmitted for re-evaluation and partial credit.

**Drone Remote Sensing Project:** The project will consist of a drone remote sensing data analysis exercise to investigate a well-posed hypothesis or question. Project deliverables will consist of: 1. A brief project proposal presentation; 2. a final project report presentation (15-minute oral), 3. Graduate students will also present their results in a short research paper. Projects may use already collected drone remote sensing data or can arrange to collect new drone remote sensing data as part of this course. The instructors will present some ideas that the students can adopt (below).

Here are a few ideas:

* Thermal IR Freeze/Thaw image calibration and landscape analysis (Colorado).
* Snow volume determination using multi-angle visible change detection (Colorado).
* Site characterization for snow meteorological field studies (Colorado).
* Vegetation characterization for agricultural management.
* 3D characterization of forest structure with LiDAR.
* Printing of 3D drone images or 3D goggle interpretation.
* Urban building measurements with drones.
* Building heat signatures using IR drone data.
* Search and rescue automatic image detection.
* Comparing Digital Surface Models derived with LiDAR vs. 3D construction with high resolution imagery

**Paper Presentation:** Each student will be required to present and lead a discussion on a published drone-based remote sensing research paper. The 15-minute presentation should be generally relevant (but not redundant) to the topic covered during that class session. Grading will be based on (1) relevancy and creativity of chosen paper/topic, (2) quality of presentation and visuals, (3) assessment of methods and drone-based sensors used and (4) responses to questions and discussion. ***Any review materials should be sent out to the class by the Friday before the presentation. Please select a date for your paper presentation – preference will be given on a first come first served basis.***

**Late Work:** All work is expected to be completed on time.

#### Disabilities: Students with disabilities that require accommodation should present the instructors with accommodation letter at the start of the semester so that all arrangements can be made in advance.

Course Outline

Date Topic

Aug 23 **In-Person Drone SfM Demo** (Field 4 Pavilion, will be recorded/posted)

**Lecture:** Course Requirements, Basic Drone Remote Sensing Concepts (Paul)

* + - * Course syllabus and expectations
      * Drone, UAV, UAS definitions and history
      * Introduction to GGS’s drone platforms
      * Drone remote sensing applications

Aug 30 **In-Person Drone Lidar Demo** (Field 4 Pavilion, will be recorded/posted)

**Lecture:** Drone components, regulations, and software (Paul)

* + - * Drone System Components
      * Overview of Drone data processing software and AWS
      * FAA Part 107 Overview

**Homework #1**

Sept 13\* **In-Person Drone Thermal Demo** (Field 4 Pavilion, will be recorded/posted)

**Lecture:** Drone Systems, Platforms and Licensing (Daniel)

**Student Paper Presentation 1**

Sept 20\* **Lecture:** Drone Remote Sensing Mission Planning (Jeremy)

**Homework #2**

Sept 27 **Lecture:** Drone Photogrammetry (Paul)

**Project Proposal Presentations** (Post presentation recordings and discussion)

* Software processing for drone imagery
* Class project expectations and ideas

Oct 4\* **Lecture:** Drone Remote Sensing Software Processing (Daniel)

**Homework #3** (Due Oct 19)

**Oct 12 (Tuesday) Lecture:** Drone deployment, sensor calibration (Paul)

[[[[[[**Graduate Student Paper Presentation 2**](file:///C:\WORK\Classes\hydrosphere\10-Streamflow.pdf)](file:///C:\WORK\Classes\hydrosphere\Hydrosphere_Lecture_8.pdf)](file:///C:\WORK\Classes\hydrosphere\Klinger_hydrotalk.pdf)](file:///C:\WORK\Classes\hydrosphere\10-Streamflow.pdf)](file:///C:\WORK\Classes\hydrosphere\Hydrosphere_Lecture_8.pdf)](file:///C:\WORK\Classes\hydrosphere\Hydrosphere_Lecture_8.pdf)

**Homework #4**

Oct 18 **Lecture** (Konrad Wessels): Multi-Spectral

* Multi-spectral sensing with UAV’s
* Collection and Processing multi-spectral imagery

**Graduate Student Paper Presentation 3**

Oct 25 **Lecture** (Konrad Wessels): LiDAR

* Drone-based LiDAR data collection and processing (Konrad)

[[[[[[**Graduate Student Paper Presentation 4**](file:///C:\WORK\Classes\hydrosphere\10-Streamflow.pdf)](file:///C:\WORK\Classes\hydrosphere\Hydrosphere_Lecture_8.pdf)](file:///C:\WORK\Classes\hydrosphere\Klinger_hydrotalk.pdf)](file:///C:\WORK\Classes\hydrosphere\10-Streamflow.pdf)](file:///C:\WORK\Classes\hydrosphere\Hydrosphere_Lecture_8.pdf)](file:///C:\WORK\Classes\hydrosphere\Hydrosphere_Lecture_8.pdf)

**Homework #5**

Nov 1 **Lecture:** Microwave (Paul)

* Drone-based microwave data collection
* P-Band, L-Band, C-Band, Signals of Opportunity

Nov 8 **Lecture:** Science and Applications 1 (Paul)

* Assman paper review

Nov 15\* **Lecture:** GMU Drone RS Case Studies (Denial & Jeremy)

Nov 22 **Lecture:** Science and Applications 2 (Paul)

* Additional paper reviews

Nov 29 **Team Project Presentations** (Post recordings and participate in discussions)

**Lecture:** Review for Final (Paul)

**Course Evaluations**

**December 13: 4:30-7:15pm Final Exam**

**DE:** Distance Education – lecture delivered via online via blackboard

[[[[[[**NOTE:** This is a course outline and is subject to revision at the discretion of the instructor. You will be informed in class if changes are made.](file:///C:\WORK\Classes\hydrosphere\FinalExamStudyGuide.pdf)](file:///C:\WORK\Classes\hydrosphere\FinalExamStudyGuide.pdf)](file:///C:\WORK\Classes\hydrosphere\Hydrosphere_Lecture_12.pdf)](file:///C:\WORK\Classes\hydrosphere\Hydrosphere_Lecture_12.pdf)](file:///C:\WORK\Classes\hydrosphere\Hydrosphere_Lecture_12.pdf)](file:///C:\WORK\Classes\hydrosphere\Houser_Ice.pdf)

**Academic Integrity**

The [University Honor Code](https://oai.gmu.edu/mason-honor-code/) is upheld and supported by the [Office for Academic Integrity](http://oai.gmu.edu/).

* The integrity of the University community is affected by the individual choices made by each of us. Mason has an Honor Code with clear guidelines regarding academic integrity. Three fundamental and rather simple principles to follow at all times are that: (1) all work submitted be your own; (2) when using the work or ideas of others, including fellow students, give full credit through accurate citations; and (3) if you are uncertain about the ground rules on a particular assignment, ask for clarification. No grade is important enough to justify academic misconduct. Plagiarism means using the exact words, opinions, or factual information from another person without giving the person credit. Writers give credit through accepted documentation styles, such as parenthetical citation, footnotes, or endnotes. Paraphrased material must also be cited, using MLA or APA format. A simple listing of books or articles is not sufficient. Plagiarism is the equivalent of intellectual robbery and cannot be tolerated in the academic setting. If you have any doubts about what constitutes plagiarism, please see me.
* As in many classes, a number of projects in this class are designed to be completed within your study group. With collaborative work, names of all the participants should appear on the work. Collaborative projects may be divided up so that individual group members complete portions of the whole, provided that group members take sufficient steps to ensure that the pieces conceptually fit together in the end product. Other projects are designed to be undertaken independently. In the latter case, you may discuss your ideas with others and conference with peers on drafts of the work; however, it is not appropriate to give your paper to someone else to revise. You are responsible for making certain that there is no question that the work you hand in is your own. If only your name appears on an assignment, your professor has the right to expect that you have done the work yourself, fully and independently.
* Mason is an Honor Code university; please see the Office for Academic Integrity for a full description of the code and the honor committee process. The principle of academic integrity is taken very seriously, and violations are treated gravely. What does academic integrity mean in this course? Essentially this: when you are responsible for a task, you will perform that task. When you rely on someone else’s work in an aspect of the performance of that task, you will give full credit in the proper, accepted form. Another aspect of academic integrity is the free play of ideas. Vigorous discussion and debate are encouraged in this course, with the firm expectation that all aspects of the class will be conducted with civility and respect for differing ideas, perspectives, and traditions. When in doubt (of any kind) please ask for guidance and clarification.

**Disability Accommodations**

Please contact the instructor concerning accommodations for disabilities. For more information about accommodations and other information related to students with disabilities, please contact Mason’s [Disability Services](http://ds.gmu.edu/). Disability Services also offers a [faculty guide](https://ds.gmu.edu/for-faculty-and-staff/). Please note that faculty are not expected to provide accommodations unless the student presents a letter from DS–but also that students can request approved accommodations from faculty at any point in the semester (going forward, not retroactively).

* Disability Services at George Mason University is committed to upholding the letter and spirit of the laws that ensure equal treatment of people with disabilities. Under the administration of University Life, Disability Services implements and coordinates reasonable accommodations and disability-related services that afford equal access to university programs and activities. Students can begin the registration process with Disability Services at any time during their enrollment at George Mason University. If you are seeking accommodations, please visit http://ds.gmu.edu/ for detailed information about the Disability Services registration process. Disability Services is located in Student Union Building I (SUB I), Suite 2500. Email:ods@gmu.edu | Phone: (703) 993-2474
* Disability Services at George Mason University is committed to providing equitable access to learning opportunities for all students by upholding the laws that ensure equal treatment of people with disabilities. If you are seeking accommodations for this class, please first visit http://ds.gmu.edu/ for detailed information about the Disability Services registration process. Then please discuss your approved accommodations with me. Disability Services is located in Student Union Building I (SUB I), Suite 2500. Email:ods@gmu.edu | Phone: (703) 993-2474

**Diversity and Inclusion**

Diversity, one of the university’s core values, is also a core value of this course. See [Mason Non-Discrimination Policy](https://universitypolicy.gmu.edu/policies/non-discrimination-policy/) or the [Mason Diversity Statement](https://stearnscenter.gmu.edu/knowledge-center/general-teaching-resources/mason-diversity-statement/). ***This course*** seeks to create a learning environment that fosters respect for people across identities. We welcome and value individuals and their differences, including gender expression and identity, race, economic status, sex, sexuality, ethnicity, national origin, first language, religion, age and ability. We encourage all members of the learning environment to engage with the material personally, but to also be open to exploring and learning from experiences different than their own. This course is an intentionally inclusive community, promotes and maintains an equitable and just work and learning environment. We welcome and value individuals and their differences including race, economic status, gender expression and identity, sex, sexual orientation, ethnicity, national origin, first language, religion, age, and disability.

**Sexual Harassment, Sexual Misconduct, and Interpersonal Violence**

George Mason University is committed to providing a learning, living and working environment that is free from discrimination and a campus that is free of sexual misconduct and other acts of interpersonal violence in order to promote community well-being and student success. We encourage students who believe that they have been sexually harassed, assaulted or subjected to sexual misconduct to seek assistance and support. [University Policy 1202: Sexual Harassment and Misconduct](https://universitypolicy.gmu.edu/policies/sexual-harassment-policy/) speaks to the specifics of Mason’s process, the resources, and the options available to students. As a faculty member, you may wish to include information about this on your syllabus. In addition to using any of the above language, consider including the following:

* As a faculty member and designated “Responsible Employee,” I am required to report all disclosures of sexual assault, interpersonal violence, and stalking to Mason’s [***Title IX Coordinator***](https://diversity.gmu.edu/sexual-misconduct) per [***university policy 1412***](https://universitypolicy.gmu.edu/policies/reporting-of-clery-act-crimes-andor-prohibited-sexual-conduct/). If you wish to speak with someone confidentially, please contact the [***Student Support and Advocacy Center***](http://ssac.gmu.edu/) (703-380-1434) or [***Counseling and Psychological Services***](https://caps.gmu.edu/) (703-993-2380). You may also seek assistance from [***Mason’s Title IX Coordinator***](https://diversity.gmu.edu/sexual-misconduct) (703-993-8730; titleix@gmu.edu).

**Privacy**

[Student privacy](http://registrar.gmu.edu/facultystaff/student-privacy/) is governed by the [Family Educational Rights and Privacy Act (FERPA)](http://www.ed.gov/policy/gen/guid/fpco/ferpa/index.html) and is an essential aspect of any course. [Instructor responsibilities with respect to student privacy](https://stearnscenter.gmu.edu/?page_id=1811&preview=true) are an important consideration when designing your syllabus, especially–though certainly not exclusively–when it comes to faculty and student digital communication. For that reason, please require students to use their Mason email. As an employee of the state of Virginia, it is also required that you use your Mason email when communicating with students. Sample syllabus language for email usage:

* Students must use their MasonLive email account to receive important University information, including communications related to this class. I will not respond to messages sent from or send messages to a non-Mason email address.

**Student emails**: In addition, please be aware that as of Fall 2018, [Virginia law designates](https://registrar.gmu.edu/ferpa/hb1-guidance-2/) student email addresses as among the records that must be kept strictly private unless students give written consent for sharing. Please **use bcc when emailing to multiple students**, to shield their email addresses, or email students from within Blackboard; you should not require students to share email addresses with other students.

**Undergraduate Course Repetition**

Students should be aware of their options for repeating an undergraduate class for credit; these policies changed in 2018. Faculty teaching high-volume undergraduate courses (such as those required for Mason Core or the major) are especially encouraged to inform students of the course repetition policy through a statement on the syllabus:

* Beginning fall 2018, there is a limit of three graded attempts for this course. A W does not count as a graded attempt. Please see AP. 1.3.4 in the University Catalog and consult with your academic advisor if you have any questions.

**University Policies**  
Students must follow the university policies. [See [http://universitypolicy.gmu.edu](http://universitypolicy.gmu.edu/)].

**Responsible Use of Computing**  
Students must follow the university policy for Responsible Use of Computing. [See <http://universitypolicy.gmu.edu/1301gen.html>].

**University Calendar**  
Students must follow the university policies. [See <http://catalog.gmu.edu>].

**Religious Holidays**

A list of religious holidays is available on the University Life Calendar page (http://ulife.gmu.edu/calendar/religious-holiday-calendar/ ). Any student whose religious observance conflicts with a scheduled course activity must contact the Instructor at least 2 weeks in advance of the conflict date in order to make alternative arrangements.

**Students are expected to follow courteous Internet etiquette.**

**Safe Return to Campus Statement:**

All students taking courses with a face-to-face component are required to take Safe Return to Campus Training prior to visiting campus. Training is available in Blackboard (https://mymason.gmu.edu). Students are required to follow the university’s public health and safety precautions and procedures outlined on the university Safe Return to Campus webpage (www2.gmu.edu/safe-return-plan). Similarly, all students in face to face and hybrid courses must also complete the Mason COVID Health Check daily, seven days a week. The COVID Health Check system uses a color code systemand students will receive either a Green, Yellow, or Red email response. Only students who receive a “green” notification are permitted to attend courses with a face-to-face component. If you suspect that you are sick or have been directed to self-isolate, please quarantine or get testing. Faculty are allowed to ask you to show them that you have received a Green email and are thereby permitted to be in class.

**Campus Closure**

If the campus closes or class is canceled due to weather or other concern, students should check Blackboard [or other instruction as appropriate] for updates on how to continue learning and information about any changes to events or assignments.

**Basic Course Technology Requirements**

Activities and assignments in this course will regularly use the Blackboard learning system, available at https://mymason.gmu.edu. Students are required to have regular, reliable access to a computer with an updated operating system (recommended: Windows 10 or Mac OSX 10.13 or higher) and a stable broadband Internet connection (cable modem, DSL, satellite broadband, etc., with a consistent 1.5 Mbps [megabits per second] download speed or higher. You can check your speed settings using the speed test on this website.)

Activities and assignments in this course will regularly use web-conferencing software (Blackboard Collaborate / Zoom). In addition to the requirements above, students are required to have a device with a functional camera and microphone. In an emergency, students can connect through a telephone call, but video connection is the expected norm.

**Course Materials and Student Privacy**

Videorecordings of class meetings that are shared only with the instructors and students officially enrolled in a class do not violate FERPA or any other privacy expectation. Videorecordings that only include the instructor (no student names, images, voices, or identifiable texts) may be shared without violating FERPA (but see below, University Policies: Privacy, for some qualifications and recommendations)

All course materials posted to Blackboard or other course site are private to this class; by federal law, any materials that identify specific students (via their name, voice, or image) must not be shared with anyone not enrolled in this class.

Videorecordings — whether made by instructors or students — of class meetings that include audio, visual, or textual information from other students are private and must not be shared outside the class

Live video conference meetings (e.g. Collaborate or Zoom) that include audio, textual, or visual information from other students must be viewed privately and not shared with others in your household or recorded and shared outside the class

**Course Recordings**

Some/All of our synchronous meetings in this class will be recorded to provide necessary information for students in this class. Recordings will be stored on Blackboard [or other secure site] and will only be accessible to students taking this course during this semester.

## Student Services:

| **NAME OF RESOURCE** | **DESCRIPTION OF RESOURCE** |
| --- | --- |
| [Advising for Exploratory Students](https://advising.gmu.edu/) | Provides advisors and coaches for students seeking or changing their major. |
| [Assistive Technology Initiative](https://ati.gmu.edu/) | Manages the production of accessible text for Mason students with disabilities. They also ensure access to information technology and communications to the entire university community through the use of adaptive equipment and provision of technical assistance. |
| [Copyright Resources Office](https://publishing.gmu.edu/communication/copyright/copyright-basics/) | Provides assistance to faculty and students regarding copyright policies. |
| [Counseling and Psychological Services](https://caps.gmu.edu/) | Offers faculty and staff consultation about how to help students that experience difficulties that impact their learning, including how to respond to students in crisis. In particular, the Mason Cares, faculty referral guide, and students of concern are primary resources for faculty and staff. Students can take advantage of psychological services, a variety of learning services, multicultural services, and educational programs that support students’ educational goals. |
| [Disability Services](https://ds.gmu.edu/) | Implements and coordinates reasonable accommodations and disability-related services that afford equal access to university programs and activities. |
| [International Programs and Services](https://oips.gmu.edu/) | Provides guidance to students and scholars studying and working at George Mason University on immigration, employment and taxation, and adjustment issues, while fostering cross-cultural understanding through programs highlighting global themes. |
| [Learning Services](https://learningservices.gmu.edu/) | Provides a variety of experience based learning opportunities through which students explore a wide range of academic concerns. Services include support to students with learning differences, individual study skills counseling, individualized programs of study, and provision of tutoring resources. Presentations on a variety of academic skill topics are available to the university community. The programs are open to all George Mason University students free of charge. Services are confidential and use of these services does not become part of the student’s academic record. |
| [Lesbian, Gay, Bisexual, Transgender, Queer, and Questioning Resources](https://lgbtq.gmu.edu/) | Promotes the academic success, health and well-being of lesbian, gay, bisexual, transgender, and queer (LGBTQ) students and their allies. Also works to sustain and strengthen a campus climate of safety, equity, inclusion, and respect in which LGBTQ and ally students can succeed and thrive at Mason. |
| [Mason Student Services Center](https://masonec.gmu.edu/) | Provides one-stop, integrated information and referrals regarding admissions, registrar, student accounts, and financial aid. |
| [Mathematics Tutoring Center](http://math.gmu.edu/tutor-center.php) | Offers tutoring on a walk-in basis for all George Mason University students who are enrolled in math courses up to MATH 290. |
| [Military Alliance Program (M.A.P.)](https://military.gmu.edu/support/military-alliance-program) | Provides faculty and staff participants with an understanding of military students at Mason and how they can be supported. Upon completion of M.A.P. training, participants are certified by the Office of Military Services as a “Military Friendly Staff Member”. |
| [Office of Academic Integrity](https://oai.gmu.edu/) | Provides information on the honor code and resources for students and faculty. |
| [Office of Diversity, Inclusion, and Multicultural Education (ODIME)](https://odime.gmu.edu/) | Serves students, cultural organizations, and the Mason community by promoting an environment that fosters and values human understanding and diversity. ODIME seeks to provide services and programs that will instill university-wide appreciation for diverse perspectives and ensure equal levels of inclusion, participation, and retention of underrepresented student groups in their quest for a quality. |
| [Office of the Ombudsman](https://diversity.gmu.edu/) | Acts as a unique resource for students to discuss concerns and complaints and serves as a safe space to facilitate the resolution of conflicts. As an impartial party, the office does not take sides in any conflict and operates independently of any formal channels at the university. |
| [Safe Zone](https://lgbtq.gmu.edu/safe-zone/) | Creates a safer, more welcoming and inclusive campus environment to strengthen community and encourage networking among faculty, staff, and students toward the goal of supporting the well-being of LGBTQ people. |
| [Social Action and Integrative Learning (SAIL)](https://sail.gmu.edu/) | Fosters experiential learning opportunities on campus, regionally, and globally for the Mason community with a particular emphasis on effecting positive social change. SAIL is Mason’s home for service-learning initiatives. |
| [Student Conduct](https://studentconduct.gmu.edu/) | Provides information about university policies, the student conduct process, and resources for faculty related to addressing student behaviors of concerns and other disruptive behaviors. |
| [Student Health Services](https://shs.gmu.edu/) | Provides high quality health care, counseling, education, and prevention services in support of student learning and retention. |
| [Student Support and Advocacy Center](https://ssac.gmu.edu/) | Provides comprehensive services for students in an effort to foster the safety and well-being of the Mason community. SSAC services include assisting students who are encountering barriers to their academic success or personal growth, interpersonal violence prevention, alcohol and drug education, health promotion/healthy relationships, student crisis intervention, and connecting students with appropriate campus and off-campus resources. |
| [UNIV Courses and Programs](https://transitions.gmu.edu/) | Serves as a resource and development center for undergraduates, providing courses, programs, and services to facilitate students’ personal and academic success. |
| [University Career Services](https://careers.gmu.edu/) | Provides information on career choices, internships and employment, and graduate and professional school. |
| [University Life](https://ulife.gmu.edu/) | Enhances students’ in- and out-of-class experiences, in addition to facilitating interactions among faculty, staff, and other students. These resources help students achieve academically, stay healthy, get involved with campus life, find jobs, and identify resources to enrich their learning. |
| [University Writing Center](https://writingcenter.gmu.edu/) | Offers both in-person and online writing assistance for students, including online writing guides, reference guides, and style manuals. Additionally, the Writing Center provides assistance to faculty who are interested in holding in-class writing workshops, developing effective writing assignments, or evaluating students’ writing. |