

**CDS 301**  
**Scientific Information and Data Visualization**

**1. General Information**

**Section:** CDS 301 – DL2, Spring 2022, CRN: 16096, 3 credits  
**Instructor:** Dr. Melanie Swartz ([mswartz2@gmu.edu](mailto:mswartz2@gmu.edu))  
**Class Meetings:** asynchronous online via Blackboard  
**Office Hours:** Virtual, send email for appointment

**2. Course Description**

The techniques and software used to visualize scientific simulations, complex information, and data visualization for knowledge discovery. Includes examples and exercises to help students develop their understanding of the role visualization plays in computational science and provides a foundation for applications in their careers.

**3. Learning Outcomes**

By the end of the course, students will be able to:

- Articulate human, visual, and interactive design issues for creating effective visualizations.
- Use a number of visualization tools and techniques to explore and analyze a variety of data.
- Create effective visualizations to communicate analytic results.
- Evaluate a visualization solution based on quantitative and qualitative metrics.

**4. Course Schedule (Tentative)**

<b>Course Schedule for CDS-301-DL2 (Spring 2022)</b>	
<b>Week</b>	<b>Topic</b>
<b>Week #1</b>	Introduction to data visualization for scientific information
<b>Week #2</b>	Visualization to explore and analyze data
<b>Week #3</b>	Principles of effective data visualization, color, shape, texture
<b>Week #4</b>	Visualizing language and text mining data
<b>Week #5</b>	Maps and spatial data visualizations
<b>Week #6</b>	Visualizing networks, connections, relationships
<b>Week #7</b>	3D plots and visualizations
<b>Week #8</b>	Break - No class
<b>Week #9</b>	Intro to image processing
<b>Week #10</b>	Static vs dynamic data visualizations
<b>Week #11</b>	Dashboards and reports
<b>Week #12</b>	Visualizing the unseeable (sound, tiny things)
<b>Week #13</b>	Data visualizations in posters and presentations
<b>Week #14</b>	<b>Student Poster Presentations (virtual)</b>
<b>Week # 15</b>	<b>Work on Final Projects</b>

\*Note: The instructor reserves the right to modify the schedule. Check Blackboard for the latest.

## 5. Lecture Format

The course will be taught as *online asynchronous mode* with pre-recorded lectures and course materials provided via Blackboard. Per university guidelines, the instructor cannot change the modality of the class from online to other format. Lectures will include foundational knowledge, theory, examples, and code demonstrations.

## 6. Blackboard

This course will make extensive use of Blackboard provided by GMU IT. Slides, videos, reading materials, and assignments will be provided via Blackboard. Content may include links to resources outside of Blackboard to publications, code, video, data, and other websites.

## 7. Textbooks

There are no required textbooks for the class. Reading material will be provided via Blackboard. Recommended books useful for this course include:

- *Fundamentals of Data Visualization* by Claus O. Wilke (this is a great foundation)
- *Data Visualization* by Kieran Healy (this is a great foundation and utilizes R)

## 8. Software Requirements

This course uses the following software: Jupyter Notebooks, Python (3.7+), RStudio, Tableau Desktop, Microsoft PowerPoint, and Microsoft Excel.

- To install Python - I found using Anaconda the easiest and it includes Jupyter. Anaconda Individual Edition can be installed via <https://www.anaconda.com/products/individual>
- To install R and R-Studio - I found <https://www.r-project.org/> as a great resource and <https://rstudio.com/>
- Due to the limited timeframe you can use the free Tableau license, we will install Tableau later in the course when we need it. To install Tableau - It's free <https://www.tableau.com/academic/students>

## 9. Technology Requirements

Activities and assignments in this course will regularly use the Blackboard learning system. Students are required to have a reliable access to a computer with an updated operating system and a stable high-speed Internet connection. In addition, your computer should have enough memory and processing power to run required software.

## 10. Grades

Students will be assigned a grade based on total points accumulated over the course, up to 100. Grading for the course is based on the following breakdown of points:

Homework	55%
Class participation	20%
Final Project Poster Presentation, Q&A, and Paper	25%

*Extra credit:* There will be extra credit points available.

*Final grades:* Based on final total score, your final grade will be determined as follows: A+ [97-100], A [93-96], A- [90-92], B+ [87-89], B [83-86], B- [80-82], C [70-79], D [60-69], F [<60].

## 11. Homework

All homework assignments must be completed per the detailed instructions provided in Blackboard and also submitted to Blackboard in order to be graded. Assignments sent via email will not be graded.

**12. Class participation**

Class participation will be graded based on discussion board forum posts and comments.

**13. Final project**

The final project for this course will involve a class virtual poster session and corresponding final paper. Both of these materials will be great for your resume and project portfolio. Details about the final project will be provided at a later date via Blackboard.

**14. Quizzes and Exams**

There are no midterm or final exams scheduled for this course. Quizzes may be given to evaluate student progress in learning the course material.

**15. Late assignments.**

Points will be deducted for all assignments submitted after the due date at a rate of 1 point per day, unless arrangements have been made with your instructor.

**16. Reaching out to the instructor**

You may contact the instructor at the GMU email address by sending email from your GMU email address or via Blackboard. Allow up to a day or two for a response. Don't hesitate to reach out with any questions, ideas, concerns or to schedule office hours.

## Course Guidelines, Policies, and Resources

### 1. Inclement weather policy

*Since this course is an online asynchronous course, students are expected to keep up with course content and complete assignments on time even in the event of a weather emergency resulting in the closure of the GMU Fairfax campus.*

### 2. Safe Return to Campus

All students are required to follow the university's public health and safety precautions and procedures outlined on the university Safe Return to Campus webpage (<https://www2.gmu.edu/safe-return-campus>).

### 3. Conduct and Behavior

During class, interactions, and in submitted assignments, students shall be professional, respectful, and courteous.

### 4. Honor Code and Academic Integrity

Students must adhere to the GMU Academic Honor Code <https://oai.gmu.edu/mason-honor-code/>. Students must be responsible for their own work and students and faculty must take on the responsibility of dealing explicitly with violations as part of academic integrity <http://academicintegrity.gmu.edu>.

### 5. Recording or sharing course content

All course materials, content, assignments, code, solutions, projects, quizzes, and exams associated with the course or on the class Blackboard shall not to be copied or shared beyond your use for the current class. Doing so is a violation of GMU's honor code. Recordings and live video conference meetings that include audio or visual information from other students are private and must not be shared or viewed by others. Doing so is a violation of FERPA.

### 6. Students with disabilities

Disability Services at George Mason University is committed to providing equitable access to learning opportunities for all students. 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 the instructor.

### 7. Diversity and Inclusion

The CDS Department 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. Check out: <https://ccee.gmu.edu/>

### 8. 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 speaks to the specifics of Mason's process, the resources, and the options available to students.

**9. Notice of mandatory reporting of sexual assault, interpersonal violence, and stalking:**

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 per university policy 1412. If you wish to speak with someone confidentially, please contact the Student Support and Advocacy Center (703-380-1434) or Counseling and Psychological Services (703-993-2380). You may also seek assistance from Mason’s Title IX Coordinator (703-993-8730; [titleix@gmu.edu](mailto:titleix@gmu.edu)).

**10. Student Resources**

Information and links regarding student support offices are available on our Student Support Resources on Campus page. The following resources are available to students:

- **Counseling and Psychological Services** – they have a variety of resources available to assist you or a friend with academic and non-academic related topics  
<https://caps.gmu.edu/>
- **The Learning Services Office** or field-specific tutoring <https://learningservices.gmu.edu/>
- **University Writing Center** <https://writingcenter.gmu.edu/>