

## **TWC 314: Data Visualization Tools and Techniques**

ASUOnline Course

### **Welcome!**

First and foremost, I want you to know how happy I am that you are in this course and how much fun we are going to have this semester. Each of you will bring to the course myriad experiences, identifications, and histories. The success of the course rests on our ability to celebrate that diversity and create a safe environment for each other where everyone feels comfortable to share and explore ideas. We must also be willing to take risks and ask critical questions. Doing so will effectively contribute to our own and others' intellectual and personal growth and development. If at any time during this course you would like to discuss ways we can make this class an even more generative space for everyone, please let me know. I am always ready to listen. I look forward to getting to know you all better over the next seven weeks.

**Course Description:** This course introduces students to the latest tools and techniques they will need to visualize data in a range of contexts. Students will practice visualizing data and learn how to assess which tools and techniques are best suited to which communication goals.

**Credits:** 3

**Prerequisites:** First-year composition

### **Faculty Information**

**Instructor:** Claire Lauer (you can call me Dr. Lauer or Claire)

**Contact Info:** Santa Catalina 240P, 480-828-3881, [claire.lauer@asu.edu](mailto:claire.lauer@asu.edu)

**Office Hours:** online via Zoom, Slack, or in person by appointment

**College Contact:** This course is offered by the College of Integrative Sciences and Arts (CISA). For more information about the college, visit our website: <https://cisa.asu.edu>. If you have questions about this course, please speak with your instructor. If your instructor is unable to address your questions, please send your inquiry to [cisa@asu.edu](mailto:cisa@asu.edu).

# Course Objectives

**During this course, students will:**

1. Be introduced to a range of software options and work environments that will facilitate their development of data visualizations to communicate information to relevant audiences.
2. Learn the affordances of various types of data processing and visualization software.
3. Practice formatting, cleaning, and analyzing data
4. Practice developing data visualizations
5. Learn how to analyze data with the goal of making recommendations to an audience

# Course Learning Outcomes

**At the completion of this course, students will be able to:**

1. Identify the elements and features that comprise a successful data visualization
2. Construct data visualizations using a range of industry-standard software
3. Assess the advantages and disadvantages of using various software to construct data visualizations for different contexts and for different purposes.
4. Organize and present data visualizations to an audience.

# Textbooks, Required Readings and Materials

Dougherty, J., and Ilya Ilyankou (2021). *Hands on Data Visualization*. O'Reilly Media.

Please note: This book is available for free through the ASU Library subscription to O'Reilly Books.

Search for the book while logged into the ASU library and you will be able to access it from there.

<https://public.tableau.com/app/discover/viz-of-the-day>

# Course Access

Your ASU courses can be accessed by both [my.asu.edu](https://my.asu.edu) and [asu.instructure.com](https://asu.instructure.com); bookmark both in the event that one site is down.

# Computer Access Requirements

This course requires the following technologies:

- Web browsers ([Chrome](#), [Mozilla Firefox](#), or [Safari](#))
- [Adobe Acrobat Reader](#) (free)
- Webcam, microphone, headset/earbuds, and speaker
- Microsoft Office ([Microsoft 365 is free](#) for all currently-enrolled ASU students)
- Reliable broadband internet connection (DSL or cable) to stream videos.
- Access to Adobe Illustrator and Tableau will be provided via ASU and tableau student licensing

*Note:* A smartphone, iPad, Chromebook, etc. will not be sufficient for completing your work in an online environment. Although you will be able to access course content with mobile devices, you must use a computer for all assignments, quizzes, and virtual labs completed in Canvas.

## Student Success

To be successful:

- check the course daily
- read announcements
- read and respond to course email messages as needed
- complete assignments by the due dates specified
- communicate regularly with your instructor and peers
- create a study and/or assignment schedule to stay on track
- access [ASU Online Student Resources](#) or [CISA Academic Resources](#)

## Course Project

For this semester you have been hypothetically “hired” by the Water Infrastructure Finance Authority of Arizona (WIFA) as a consultant to help them determine how they should distribute much-needed grant money to communities around the state in a way that is both equitable and that conserves the most water. Since 2000, Arizona and the surrounding region has experienced an exceptional “megadrought,” which has led the driest 22-year period in at least the last 1,200 years. And yet, Arizona is home to many of the most rapidly growing, urbanizing, and diversifying areas in the country. High agricultural demand, growing municipal demand, land use changes, and aging infrastructure are worsening the effects of the drought. The state has appropriated 200 million dollars to WIFA (<https://www.azwifa.gov/>) to provide grants to communities to help them implement conservation programs, infrastructure upgrades, monitoring advancement, and other water-saving measures. WIFA has awarded a total of \$15 million to communities thus far, with ongoing award cycles happening over the next year. It is your job to take the publicly available data of grant applications, and clean, process, and visualize the data in a variety of ways that will enable you to analyze it and make recommendations to WIFA about which projects they should fund next. After learning how to work with simple data and use various software technologies to visualize that data, you will produce a recommendation report (as a document, slide deck, or similar format) that you will “present” to WIFA identifying your recommendations for which projects should be funded and why. This project is intended as a low-stakes introduction to data visualization tools and techniques that should be thought-provoking, timely, and fun.

## Course Outline

### **Week .5: Introduction to data visualization, water in Arizona, and the WIFA grants program**

*Thursday, August 17 – Sunday, August 20*

**Read:** Introduction to our textbook *Hands-On Data Visualization (HODV)*

**Watch:** Videos from Rhett Larson introducing the Arizona drought, and from WIFA introducing the grants program

**Post:** Introduce yourself and share an example that relates to the points being made in the introduction of *HODV*.

## **Week 1: Working with Data**

*Monday, August 21 – Sunday, August 27*

**Read:** Chapters 1 and 2 of *HODV*

**Do:** Download WIFA proposals spreadsheets from course shell to work with in both Excel and Google Sheets. Follow tutorials in book showing how to work with data. Adapt tutorials to WIFA data. Use book-supplied data for tutorials where appropriate.

**Watch:** Short course video introducing how to experiment with pivot tables using the WIFA data and how to cluster similar data

**Quiz:** Chapter 1

**Submit:** Updated WIFA spreadsheet and examples of other data processing from Chapter 1 and 2

## **Week 2: Cleaning and processing data further**

*Monday, August 28 – Sunday, September 3*

**Read:** Chapters 3-5 of *HODV*. Regardless of whether it all applies to the WIFA data, the reading will alert you to what is possible when cleaning data.

**Do:** Follow tutorials in book showing how to clean and process data. Adapt tutorials to WIFA data. Use book-supplied data for tutorials where appropriate.

**Quiz:** Chapter 5

**Submit:** Updated/cleaned WIFA spreadsheet with accompanying explanation as to what you did, what you experimented with, and why.

## **Week 3: Visualizing Data**

*Monday, September 4 – Sunday, September 10*

**Read:** Chapter 6 of *HODV*

**Do:** Follow tutorials in book showing how to visualize data. Adapt tutorials to WIFA data. Use book-supplied data for tutorials where appropriate.

**Watch:** short course video showing how to graph WIFA data in Excel and annotate in PowerPoint

**Quiz:** Chapter 6

**Submit:** Various annotated graphs using WIFA data with accompanying explanations why you visualized them the way you did.

## **Week 4: Mapping Data**

*Monday, September 11 – Sunday, September 17*

**Read:** Chapter 7 of *HODV*

**Do:** Follow tutorials in book showing how to map data. Adapt tutorials to WIFA data. Use book-supplied data for tutorials where appropriate.

**Quiz:** Chapter 7

**Submit:** Various annotated maps from WIFA data and explanations why you mapped them the way you did.

## **Week 5: Experimenting with Advanced Tools**

*Monday, September 18 – Sunday, September 24*

**Read:** Your choice of any of the four chapters of Part III of HODV

**Do:** Follow tutorials in any of the chapters in Part III showing how to visualize data in options like chart.js, Leaflet, etc., and/or, watch a video or series of videos about Tableau (from Tableau, Tableau Tim or similar) and experiment with features of Tableau that interest you. Adapt tutorials to WIFA data. Use book-supplied data for tutorials where appropriate

**Quiz:** No quiz

**Submit:** Various visualizations from WIFA data and explanations why you visualized them the way you did.

## **Week 6: Ethics and Storytelling**

*Monday, September 25 – Sunday, September 30*

**Read:** Chapters 14 and 15 of HODV

**Watch:** My presentation about deceptive tactics used in data visualizations

**Do:** Finalize graphs/maps and begin crafting the story of your recommendations to WIFA

**Quiz:** Video and Chapters 14 and 15

**Post:** By the end of this week you will post a draft of your final recommendation report to WIFA

## **Week 7: Review and Revise**

*Monday, October 2 – Friday, October 6*

**Do:** Review three reports and revise your report according to feedback from myself and your peers

**Post:** By October 6, post a final draft of your recommendation report to WIFA

## **Grading**

All assignments, unless otherwise announced, **MUST** be submitted to the designated area of Canvas before class time. Do not submit an assignment via email.

Grades reflect your performance on assignments and adherence to deadlines. Here is the breakdown of grades for this class:

Assignment	Week	Grade
Weekly discussion and visualization work	10% each week x 7 weeks	70%
Quizzes	5 weeks x 2% each week	10%
Recommendation Report	Week 7	20%
<b>Total</b>		<b>100%</b>

Your grade will be determined based on the following grading schema:

A	Percentage
A+	100-97%
A	<97-94%
A-	<94-90%
B+	<90-87%
B	<87-84%
B-	<84-80%
C+	<80-77%
C	<77-70%
D	<70-60%
E	<60%
EU	<60%
EN	0%

Grades reflect your performance on assignments and adherence to deadlines. Grades on assignments will be available within 72 hours of the due date in the Gradebook.

## Communicating with your Instructor and Classmates

### Classroom Community

To build a course climate that is comfortable for all, it is important that students (1) display respect for all members of the class – including the instructor and students; (2) pay attention to and participate in all interactive student partner/instructor sessions and activities; and (3) observe the rules of appropriate online behavior (also known as *netiquette*). This term is defined by the instructor and includes keeping course discussion posts and oral communication with other students (or the instructor) focused on the assigned topics. Students must maintain a cordial atmosphere and use tact in expressing differences of opinion. In addition, they must avoid racist, sexist, homophobic, or other negative language that may unnecessarily exclude course members. This is not an exhaustive list of behaviors; rather, it represents examples of the types of things that can have a dramatic impact on the course environment. Your final grade may be reduced each time you engage in the types of negative behaviors indicated above.

## Community Forum

This course uses a Canvas discussion topic called "Community Forum" for general questions and comments about the course. Check the syllabus, announcements, and existing posts to ensure it's not redundant prior to posting a question or comment. You are encouraged to respond to the questions of your classmates.

Email questions of a personal nature to your instructor. You can expect a response within 24 of hours.

## Chat

The Chat tool in Canvas allows students and teachers to interact in real time. Use Chat only for informal course-related conversations unless your instructor informs you otherwise. Chat is not ideal for questions about assignments; instructors are not required to monitor it and conversations may be buried or lost.

## Email

ASU email is an [official means of communication](#) among students, faculty, and staff. Students are expected to read and act upon email in a timely fashion. Students bear the responsibility of missed messages and should check their ASU-assigned email regularly.

***All instructor correspondence will be sent to your ASU email account.***

## ASU Online Course Policies

View the [ASU Online Course Policies](#)

## Submitting Assignments

Please keep a copy of everything you hand in. All assignments, unless otherwise announced by the instructor, MUST be submitted to the designated area of Canvas. Do not submit an assignment via email.

Assignment due dates follow Arizona Standard time. Click the following link to access the [Time Converter](#) to ensure you account for the difference in time zones. Note: Arizona does not observe daylight savings time.

## Course Time Commitment

Coursework includes all learning activities including reading, watching videos, studying, and completing assignments. Arizona Board of Regents (ABOR) requires 45 hours of coursework per credit for college-level courses, which translates to:

- 1 credit hour = 45 total hours
- 2 credit hours = 90 total hours
- 3 credit hours = 135 total hours
- 4 credit hours = 180 total hours
- 5 credit hours = 225 total hours

ASU courses range in length from 6 weeks to 15 weeks. Below is a breakdown of the 135-hour required time commitment for a three-credit course divided among weeks for courses of various lengths.

Course Length	Time on Coursework per Week for a 3-credit course	Total Time Requirement for a 3-credit Course
6 weeks	22.5 hours	135 hours
7.5 weeks	18 hours	135 hours
8 weeks	17 hours	135 hours
15 weeks	9 hours	135 hours

## Drop and Add Dates/Withdrawals

If you are unable to take this course for any reason, be aware that there is a limited timeline to [drop or add the course](#). Consult with your advisor and notify your instructor to add or drop this course. If you are considering a withdrawal, review the following ASU policies: [Withdrawal from Classes](#), [Withdrawing as a Financial Aid Recipient](#), [Medical/Compassionate Withdrawal](#), and a [Grade of Incomplete](#).

## Grade Appeals

Students must first speak with the instructor of the class to discuss any disputed grades. If, after review, a resolution is not achieved, students may proceed with the appeal process. Student grade appeals must be processed in the regular semester immediately following the issuance of the grade in dispute (by commencement for fall or spring), regardless whether the student is enrolled at the university. Complete details are available in the [CISA Grade Appeals policy](#).

## Academic Integrity



Academic honesty is expected of all students in all examinations, papers, laboratory work, academic transactions and records. The possible sanctions include, but are not limited to, appropriate grade penalties, course failure (indicated on the transcript as a grade of E), course failure due to academic dishonesty (indicated on the transcript as a grade of XE), loss of registration privileges, disqualification and dismissal. For more information, see [provost.asu.edu/academicintegrity](http://provost.asu.edu/academicintegrity).

If you fail to meet the standards of academic integrity in any of the criteria listed on the university policy website, sanctions will be imposed by the instructor, college, and/or dean. Academic dishonesty includes, but is not limited to, cheating on an academic evaluation or assignment, plagiarizing, academic deceit (such as fabricating data or information), or falsifying academic records. Turning in an assignment (all or in part) that you completed for a previous class is considered self-plagiarism and falls under these guidelines. Any infractions of self-plagiarism are subject to the same penalties as copying someone else's work without proper citations. Students who have taken this class previously and would like to use the work from previous assignments should contact the instructor for permission to do so.

If you have any questions about your work and the academic integrity policy, please discuss your assignment or concerns with your instructor, teaching assistant, or your college Academic Integrity Officer in advance of submitting an assignment. Student resources on Sun Devil Integrity and strategies for completing your work with integrity and avoiding plagiarism are available here: [ASU Student Resources for Academic Integrity](#) or [provost.asu.edu/academicintegrity](http://provost.asu.edu/academicintegrity) for more information.

## Harassment Prohibited

ASU policy prohibits harassment on the basis of race, sex, gender identity, age, religion, national origin, disability, sexual orientation, Vietnam era veteran status, and other protected veteran status. Violations of this policy may result in disciplinary action, including termination of employees or expulsion of students. Students are encouraged to report harassment to instructors and the Dean of Students Office.

## Student Conduct

ASU and the College of Integrative Sciences and Arts expects and requires its students to act with honesty, integrity, and respect. Required behavior standards are listed in the [Student Code of Conduct and Student Disciplinary Procedures](#), [Computer, Internet, and Electronic Communications policy](#), [ASU Student Academic Integrity Policy](#), and outlined by the [Office of Student Rights & Responsibilities](#). Anyone in violation of these policies is subject to sanctions. [Students are entitled to receive instruction free from interference](#) by other members of the class. An instructor may withdraw a student from the course when the student's behavior disrupts the educational process per [Instructor Withdrawal of a Student for Disruptive Classroom Behavior](#). The Office of Student Rights and Responsibilities accepts [incident reports](#) from students, faculty, staff, or other persons who believe that a student or a student organization may have violated the Student Code of Conduct.

Students must refrain from uploading to any course shell, discussion board, or website used by the course instructor or other course forum, material that is not the student's original work, unless the students first comply with all applicable copyright laws; faculty members reserve the right to delete materials on the grounds of suspected copyright infringement.

## Title IX

Title IX is a federal law that provides that no person be excluded on the basis of sex from participation in, be denied benefits of, or be subjected to discrimination under any education program or activity. Both Title IX and university policy make clear that sexual violence and harassment based on sex is prohibited. An individual who believes they have been subjected to sexual violence or harassed on the basis of sex can seek support, including counseling and academic support, from the university. If you or someone you know has been harassed on the basis of sex or sexually assaulted, you can find information and resources at <https://sexualviolenceprevention.asu.edu/faqs>.

As a mandated reporter, I am obligated to report any information I become aware of regarding alleged acts of sexual discrimination, including sexual violence and dating violence. ASU Counseling Services, <https://eoss.asu.edu/counseling>, is available if you wish to discuss any concerns confidentially and privately. ASU online students may access 360 Life Services, <https://goto.asuonline.asu.edu/success/online-resources.html>.

## Student Accessibility and Inclusive Learning Services (SAILS)

Qualified students with disabilities who will require disability accommodations in this class are encouraged to make their requests to the instructor at the beginning of the semester either during office hours or by appointment. Note: Prior to receiving disability accommodations, verification of eligibility from the Student Accessibility and Inclusive Learning Services is required. Disability information is confidential.

**Student Accessibility and Inclusive Learning Services** ([eoss.asu.edu/drc](https://eoss.asu.edu/drc))

**Email:** DRC@asu.edu

**SAILS Phone:** 480-965-1234

**SAILS FAX:** 480-965-0441

## Tutoring

Free tutoring support is available in person and online for most courses. Services are offered through ASU's University Academic Success Programs for currently enrolled students.

- Tutoring is available in math, business, science, statistics, and engineering courses.
- Writing tutoring is available for any writing project at any stage of the writing process.
- Supplemental Instruction (SI) facilitates collaborative study groups for selected courses.
- Graduate academic tutoring is available for writing and statistics.
- Academic skills tutoring can help with critical reading, study skills, note taking, and more.
- Resources are available through our YouTube channel, Zoom recordings, and handouts.

Visit <https://tutoring.asu.edu> or call (480) 965-9072 for more information about these services, to view our schedules, or to book an appointment.

## Statement on Inclusion

Arizona State University is deeply committed to positioning itself as one of the great new universities by seeking to build excellence, enhance access, and have an impact on our community, state, nation, and the world. To do that requires our faculty and staff to reflect the intellectual, ethnic, and cultural diversity of our nation and world so that our students learn from the broadest perspectives, and we engage in the advancement of knowledge with the most inclusive understanding possible of the issues we are addressing through our scholarly activities. We recognize that race and gender historically have been markers of diversity in institutions of higher education. However, at ASU, we believe that diversity includes additional categories such as socioeconomic background, religion, sexual orientation, gender identity, age, disability, veteran status, nationality, and intellectual perspective.

## Mental Health

As a student, like anyone else, you may experience a range of challenges that can interfere with learning, such as strained relationships, increased anxiety, substance use, feeling down, difficulty concentrating, and/or lack of motivation. These emotional health concerns or stressful events may diminish your academic performance and/or reduce your ability to participate in daily activities. ASU Counseling Services provides counseling and crisis services for students who are experiencing a mental health concern. Any student may call or walk-in to any ASU counseling center for a same-day or future appointment to discuss any personal concern. Here is the website: [eoss.asu.edu/counseling](https://eoss.asu.edu/counseling). After office hours and 24/7 ASU's dedicated crisis line is available for crisis consultation by calling 480-921-1006.

## Establishing a Safe Environment

Learning takes place best when a safe environment is established in the classroom. In accordance with [SSM 104-02](#) of the Student Services Manual, students enrolled in this course have a responsibility to support an environment that nurtures individual and group differences and encourages engaged, honest discussions. The success of the course rests on your ability to create a safe environment where everyone feels comfortable to share and explore ideas. We must also be willing to take risks and ask critical questions. Doing so will effectively contribute to our own and others' intellectual and personal growth and development. We welcome disagreements in the spirit of critical academic exchange, but please remember to be respectful of others' viewpoints, whether you agree with them or not.

All incidents and allegations of violent or threatening conduct by an ASU student (whether on- or off-campus) must be reported to the ASU Police Department (ASU PD) and the [Office of the Dean of Students](#). If either office determines that the behavior poses or has posed a serious threat to personal safety or to the welfare of the campus, the student will not be permitted to return to campus or reside in any ASU residence hall until an appropriate threat assessment has been completed and, if necessary, conditions for return are imposed. ASU PD, the Office of the Dean of Students, and other appropriate offices will coordinate the assessment in light of the relevant circumstances.

## Prohibition of Commercial Notetaking Services

In accordance with [ACD 304-06 Commercial Note Taking Services](#), written permission must be secured from the official instructor of the class in order to sell the instructor's oral communication in the form of notes. Notes must have the note taker's name as well as the instructor's name, the course number, and the date.

## Course Evaluation

Students are expected to complete the course evaluation. The feedback provides valuable information to the instructor and the college and is used to improve student learning. Students are notified when the online evaluation form is available. The results are always anonymous and cannot be reviewed by the instructor/department until after final grades have been posted.

## Trigger Warning

Please note that some course content may be deemed offensive by some students, although it is not my intention to offend anyone. In addition, some materials that we link with online might also be considered offensive, troubling, or difficult to review in terms of language or graphics. I attempt to provide warnings when introducing this kind of material; yet, if I forget to do so, or if something else (in my materials or posts from fellow students) seems offensive, please contact me at [claire.lauer@asu.edu](mailto:claire.lauer@asu.edu), or the faculty head, Andrew Mara, at .

## Academic Affairs Manual

For a complete guide to Arizona State University course policies, please refer to the [Academic Affairs Manual \(ACD\)](#).

## Syllabus Disclaimer

The syllabus is a statement of intent and serves as an implicit agreement between the instructor and the student. Every effort will be made to avoid changing the course schedule but the possibility exists that unforeseen events will make syllabus changes necessary. Remember to check your ASU email and the course site often.