

# DSA 8020: Statistical Methods II

## Spring 2022, Fully Online

**Instructor:** Whitney Huang  
**Office:** O-221 Martin Hall

**Email:** [wkhuang@clermson.edu](mailto:wkhuang@clermson.edu)  
**Office Phone:** (864) 656-3070

**Office Hours:** Weekly Zoom night sessions (Wednesdays 8:15pm-9:15pm ET) and by appointment

### Reference Books:

- *Linear Models with R*, 2<sub>nd</sub> Edition, **Julian Faraway**, 2014 [\[Link\]](#)
- *Extending the Linear Model with R*, 2<sub>nd</sub> Edition, **Julian Faraway**, 2016 [\[Link\]](#)
- *A First Course in Design and Analysis of Experiments*, **Gary W. Oehlert**, 2010 [\[Link\]](#)
- *Design and Analysis of Experiments*, 2<sub>nd</sub> Edition, **Angela Dean, Daniel Voss, and Danel Draguljic**, 2017 [\[Link\]](#)
- *An Introduction to Statistical Learning: with Applications in R*, 2<sub>nd</sub> Edition, **Gareth James, Daniela Witten, Trevor Hastie, and Robert Tibshirani**, 2021 [\[Link\]](#)
- *Time Series Analysis with Applications in R*, 2<sub>nd</sub> Edition, **Jonathan Cryer and Kung-Sik Chan**, 2008 [\[Link\]](#)
- *Handbook of Spatial Statistics*, **Alan Gelfand, Peter Diggle, Peter Guttorp, and Montserrat Fuentes**, 2010 [\[Link\]](#)

**Statistical Software:** The R project for Statistical Computing (<https://www.r-project.org/>) and RStudio (<https://rstudio.com/products/rstudio/>), an integrated development environment (IDE) for R.

### Prerequisites:

- DSA 8010 (Statistical Methods I)
- Basic statistical computing knowledge: R will be used in class

### Course Objectives:

Upon successful completion of this course, students should be able to:

0. read research data into a computer package
1. summarize and interpret research data

2. apply statistical techniques and knowledge appropriately
3. perform statistical analyses using a software package and interpret software output
4. draw appropriate conclusions and inferences from data

### Statement of instructor/student interaction:

Students are expected to interact with each other and with the instructor on a weekly basis. Interactive discussions on course topics will take place in Discussion Board on Canvas.

### Attendance:

This course is entirely asynchronous. Successful students will engage with the course material each week and participate on a regular basis.

### Course Grading:

- Students will be expected to demonstrate ability in computation, critical statistical thinking, and clear communication of statistical methods and results. Grades will be weighted as follows:

R Labs	25%
Project I	25%
Project II	25%
Project III	25%

- Final course grades will be assigned using the following grading scheme:

$\geq 90.00$	A
88.00 ~ 89.99	A-
85.00 ~ 87.99	B+
80.00 ~ 84.99	B
78.00 ~ 79.99	B-
75.00 ~ 77.99	C+
70.00 ~ 74.99	C
68.00 ~ 69.99	C-
$\leq 67.99$	F

### Key Dates:

Students can use **iROAR** to add courses through **Jan. 11, Tuesday**, to drop courses without record through **Jan. 26, Wednesday**, and to drop with a W grade through **Mar. 18, Friday**.

- **Jan. 17, Monday:** Martin Luther King Jr. holiday
- **Mar. 21 - Mar. 25:** Spring Break

### **Specific COVID-19 related information:**

Due to pandemic circumstances which may impact student attendance (such as quarantine), students should not receive grade penalties for unexcused absences. For a student who reports testing positive or is being asked to quarantine/isolate because of exposure to the virus, it will be up to the student to inform the instructor that they will be moving to online-only instruction for at least the next two weeks. Students are directed to use the Notification of Absence link in Canvas to initiate this notification, which can be found under the “help” button on the left navigation. Additional communication via email is encouraged; students should follow up with their instructor to develop a continued plan of study for each course. Students cannot be penalized in their grade for needing to move to online instruction.

### **Make-up Work Due to Missed Attendance:**

1. Students should speak with their course instructors regarding any scheduled absence as soon as possible and develop a plan for any make-up work.
2. In the event of an emergency, the student should make direct contact with the course instructor, preferably before a class or an exam takes place. It is the student’s responsibility to secure documentation of emergencies, if required.
3. Course instructors must implement fair grading procedures and provide an opportunity to make up missed assignments and examinations that does not unfairly penalize the student. Issuing specific dates by which make up work must be submitted without confirmation from the student could constitute unfair penalization, as students with illness (including COVID-19-related illness) may not always respond in a timely manner. Such make-up work shall be at the same level of difficulty with the missed assignment or examination. Course instructors shall hold all students to the same standard for making up missed assignments or examinations.
4. While course instructors should seek to make reasonable accommodation for a student involved in University-sponsored activities, students should understand that not every course can accommodate absences and that absences do not lessen the need to meet all course objectives.

### **Notification of Absence:**

1. The Notification of Absence module in Canvas allows students to quickly notify instructors (via an email) of an absence from class and provides for the following categories: court attendance, death of family member, illness (or COVID-19 related isolation), illness of family member, injury, military duty, religious observance, scheduled surgery, university function, unscheduled hospitalization, other anticipated absence, or other unanticipated absence. The notification form requires a brief explanation, dates and times. Based on the dates and times indicated, instructors are automatically selected, but students may decide which instructors will receive the notification. This does not serve as an “excuse” from class, and students are encouraged to discuss the absence with their instructors. If a student is unable to report the absence electronically, he/she may call the Office of Advocacy and Success at 656- 0935 for assistance and guidance.

2. The Office of Advocacy and Success also assists students in identifying various appropriate methods of documenting absences and assists families in using the electronic Notification of Absence system when students are unable to do so themselves.

### **Class Participation:**

Due to the possibility that students might shift to online learning while in isolation/quarantine, class participation grades need to be structured in ways that do not penalize students that are suddenly unable to attend class in person. Instructors are encouraged to shift class participation assessment and point/grade allocation to other engaged activities that all students can accomplish, even those accessing the course remotely.

### **Policies on Incompletes and Medical Withdrawals:**

1. Issuing an “Incomplete” grade (I) to a student is an option if a student is unable to complete makeup work in a timely manner due to COVID-19 related illness or other issues. An Incomplete indicates that a relatively small part of the semester’s work remains undone. It is not intended for students who are failing a course otherwise. In the event that an Incomplete is appropriate, students will contact instructors in a timely manner so that instructors can provide a reasonable opportunity to complete remaining work. Instructors and students will work together to resolve the Incomplete grade as soon as possible, not to exceed thirty days from the first day of classes in the next scheduled session (excluding summer sessions and regardless of the student’s enrollment status). More information on an Incomplete grade can be found in the Undergraduate Catalog.
2. Sometimes due to illness (including COVID-19 related illness) or other life circumstances, students may not be able to complete academic work for the term and will need to withdraw from all classes. The Division of Undergraduate Studies will process medical withdrawals. Students should contact the Division by sending an email from their Clemson email address to Lisa Traynham at [ltrayn@clemson.edu](mailto:ltrayn@clemson.edu).

If you report testing positive for COVID or have been asked to quarantine/isolate because of exposure to the virus, it will be up to you to inform your instructor that you will be moving to online only instruction for at least the next two weeks. Students are directed to use the Notification of Absence module in Canvas to initiate this notification. Additional communication via email is encouraged; you should follow up with your instructor to develop a continued plan of study.

### **Academic Integrity Statement:**

“As members of the Clemson University community, we have inherited Thomas Green Clemson’s vision of this institution as a ‘high seminary of learning.’ Fundamental to this vision is a mutual commitment to truthfulness, honor, and responsibility, without which we cannot earn the trust and respect of others. Furthermore, we recognize that academic dishonesty detracts from the value of a Clemson degree. Therefore, we shall not tolerate lying, cheating, or stealing in any form. In instances where academic standards may have been compromised, Clemson University has a responsibility to respond appropriately to charges of violations of academic integrity.”

Please refer to the current Graduate School Policy Handbook for the graduate academic integrity policy.

### **Disability Access Statement:**

It is university policy to provide, on a flexible and individualized basis, reasonable accommodations to students who have disabilities. Students with disabilities requesting accommodations should make an appointment with Disability Services (656-6848), to discuss specific needs within the first month of classes. Students should present a Faculty Accommodation Letter from Student Disability Services when they meet with instructors. Accommodations are not retroactive and new Faculty Accommodation Letters must be presented each semester.

### **Title IX Statement:**

Clemson University is committed to a policy of equal opportunity for all persons and does not discriminate on the basis of race, color, religion, sex, sexual orientation, gender, pregnancy, national origin, age, disability, veteran's status, genetic information or protected activity (e.g., opposition to prohibited discrimination or participation in any complaint process, etc.) in employment, educational programs and activities, admissions and financial aid. This includes a prohibition against sexual harassment and sexual violence as mandated by Title IX of the Education Amendments of 1972. The University is committed to combatting sexual harassment and sexual violence. As a result, you should know that University faculty and staff members who work directly with students are required to report any instances of sexual harassment and sexual violence, to the University's Title IX Coordinator. What this means is that as your professor, I am required to report any incidents of sexual harassment, sexual violence or misconduct, stalking, domestic and/or relationship violence that are directly reported to me, or of which I am somehow made aware. There are two important exceptions to this requirement about which you should be aware: Confidential Resources and facilitators of sexual awareness programs such as "Take Back the Night and Aspire to be Well" when acting in those capacities, are not required to report incidents of sexual discrimination. Another important exception to the reporting requirement exists for academic work. Disclosures about sexual harassment, sexual violence, stalking, domestic and/or relationship violence that are shared as part of an academic project, a research project, classroom discussion, or course assignment, are not required to be disclosed to the University's Title IX Coordinator. This policy is located at <http://www.clemson.edu/campus-life/campus-services/access/non-discrimination-policy.html>. Ms. Alesia Smith is the Executive Director for Equity Compliance and the Title IX Coordinator. Her office is located at 223 Holtzendorff Hall, phone number is 864.656.3181, and email address is [alesias@clemson.edu](mailto:alesias@clemson.edu).

### **Inclement Weather:**

Any exam that was scheduled at the time of a class cancellation due to inclement weather will be given at the next class meeting unless contacted by the instructor. Any assignments due at the time of a class cancellation due to inclement weather will be due at the next class meeting unless contacted by the instructor. Any extension or postponement of assignments or exams must be granted by the instructor via email or Canvas within 24 hours of the weather related cancellation.

## **Tentative Topics:**

### **Part I: Regression Analysis (7 weeks)**

- Review of Simple Linear Regression
- Multiple Linear Regression: Statistical Inference; Model Selection and Diagnostics
- Regression Models with Quantitative and Qualitative Predictors
- Nonlinear and Non-parametric Regression
- Ridge Regression and Lasso
- Logistic Regression, Poisson Regression, and Generalized Linear Model (GLM)

### **Part II: Experimental Design (4 weeks)**

- Introduction to Experimental Design: Principles and Techniques
- Completely randomized Designs, Block Designs, Nested and Split-Plot Designs
- Random and Mixed Effects Models
- Computer Experiments

### **Part III: Spatial and Time Series Analysis (4 weeks)**

- Stationary processes in time and autocovariance function
- Autoregressive Integrated Moving Average (ARIMA) models
- Stationary and isotropic processes in space
- Gaussian process spatial interpolation (a.k.a Kriging)