CE 760

Stochastic Hydrology

Fall 2025

Instructor and Contact Information:

Instructor: **Joshua K. Roundy, Ph.D., P.E.**
Associate Professor of Civil, Environmental, and Architectural Engineering
2153 Learned Hall
785-864-3134
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Office Hours:
W 5:00 to 6:00 PM
You may also send an email to ask a question or to schedule a meeting.

Required Texts and Instructional Materials:

Required Text: There is no required text for this course. Lecture slides and other required readings will be provided through Canvas.

Recommended Text: Wilks, D.S. (2020). ***Statistical Methods in Atmospheric Sciences*** (4th edition), Elsevier ISBN: 978-0-12-815823-4

Required Software: All assignments will be completed using Python programming in a Jupyter Notebook run through Google Colabs. A free Google account is required to run Google Colabs. No previous knowledge with programming is required for this course. If you need extra help with learning this tool please contact the instructor.

Class Time and Location:

Class Time & Location: Wednesday 6:00-8:50 PM
LEEP2 2420

Course Description:

This methods-based course includes probability models, parameter estimation, ensemble forecasting and verification, time series analysis, multivariate distributions, machine learning as well as other stochastic methods imperative to hydrologic analysis and prediction. The application of these methods will be explored through examples in hydrology related to rainfall, streamflow, soil moisture, and land-atmosphere interactions at catchment to global scales.

Instructional Mode and Credit Hours:

This course is offered as an in-person course or a synchronous online course that fulfills 3 credit hours; Consistent with KU policy and the federal definition of a credit hour, this means you should expect to spend at least 9 hours a week on this course over the 15-week semester. Most weeks, 3 hours will be instructional time in the classroom (i.e., class meetings) and the remaining time will involve out-of-class work.

Course Learning Outcomes:

Upon successful completion of this course, the student will be able to:

- Generate meaningful and relevant research questions about the hydrologic cycle.
- Conduct relevant statistical analysis to answer research questions.
- Communicate statistical and hydrologic understanding through written and oral presentations.
- Develop a better understanding of statistical methods and the hydrologic cycle.

Instructor's Attendance/Participation Policy:

The knowledge and skills you will gain in this course are dependent on your participation in class activities and are part of your grade in this course. Because of that, the student is expected to attend all class sessions unless they are ill or have a University excused absence. In the event that the student has to miss class, please talk to the instructor beforehand. If you need to report an extended illness or serious accident, please contact Student Support and Case Management at studentsupport@ku.edu or 785-864-7022.

Course Requirements:

Every student will be required to complete four types of learning assessments in order to demonstrate sufficient learning and retention of the course content and meet the learning objectives. There is a total of 600 points possible through the course as outlined below:

- **Unit Report (UR)** - There are 12-unit reports throughout the course, each worth 20 points for a total of 240 points. Unit reports provide an opportunity to apply and expand your knowledge of the weekly topic by writing a short research report of what you have learned. Your report should follow the general style and formatting of the example report available on Canvas. Unit reports should be turned in by Friday at 5pm the week after the lecture.
- **Unit Presentations (UP):** There are 12-unit presentations throughout the course, each worth 5 points for a total of 60 points. Each week the student will present a one slide summary of their unit report from the previous week. It is ok for these summaries to be incomplete or contain questions. Students will receive constructive feedback about their presentation and will receive full points just for presenting. Unit Presentations should be uploaded to Canvas by 5pm on Wednesdays.
- **Exams (EX)**: There is one exam in this course worth 100 points. The exam will be in class on Wednesday November 17th and will consist of conceptional and quantitative questions on the material covered in class (lecture 1-8). The exam will be in class and will consist of the conceptional and quantitative questions on the material covered in class (Like the handout problems).
- **Research Project (RP)**: As part of this course, the student will develop and carry out a statistical analysis that is based on their research or personal interests. The research project is worth 200 points. There are three components of the research project:
    - **Project Proposal (50 points):** The project proposal is a 1 to 2-page document describing the project and should include three sections, Motivation, Methods and Expected Results. The methods section must explicitly discuss what statistical

methods will be used. If the student is having a difficult time choosing a project, please see the instructor for some ideas. The document should be single spaced with 12pt Times New Roman font. Project proposals are due Friday, September 24th at 5pm.

- **Project Presentation (75 points):** As part of the research project, the student will give a 10-minute presentation to the class about their work. Presentations will be given through zoom in class on Wednesday, December 3rd from 6-8:50pm.
- **Final Report: (75 points):** The final report is a 5 to 10-page document describing the project and results. The final report should consist of 5 sections, Introduction, Methods, Results, Conclusions and References. The document should be single spaced with 12pt Times New Roman font. The final report is due Wednesday, December 10th at 5:00pm.

Classroom Behavior Expectations:

This course aims for ALL students to experience a safe learning environment. It is possible that a student may not agree with everything that is said or discussed in the classroom. Please be courteous and respectful to everyone and be sure that you make a distinction between criticizing an idea and criticizing the person.

Students who engage in disruptive behavior, including persistent refusal to observe boundaries defined by the instructor regarding inappropriate talking, discussions, and questions in the classroom or laboratory may be subject to discipline for non-academic misconduct for disruption of teaching or academic misconduct, as defined in the Code of Student Rights and Responsibilities (CSRR). The CSRR also defines potential sanctions for these types of infractions.

Except for in cases of a University Excused Absence, all assignments are due by the day/time indicated in the course calendar.

Special Accreditation Requirements:

This course is not designed to meet any accreditation requirements.

Evaluation Criteria with Grading Scale:

An overall course grade will be assigned based on the following cumulative point system:

Unit Reports	12 reports worth 20 points each	240
Unit Presentations	12 presentations worth 5 points each	60
Exam	1 exam worth 100 points	100
Research Project		
	Proposal	50
	Presentation	75
	Report	75
TOTAL POINTS		**600**

Letter Grades will be assigned as follows:

Grade	Points
A	560-600
A-	540-559
B+	520-539
B	500-519
B-	480-499

Grade	Percentage Range
C+	460-479
C	440-459
C-	420-439
D	360-419
F	< 360

These thresholds may be adjusted downwards (in the students favor) at the instructor's discretion but will not be adjusted upwards.

At the conclusion of this course, the University will provide an opportunity for you to provide feedback via an online (anonymous) Student Survey of Teaching. The student is strongly encouraged to take advantage of this opportunity to provide feedback. More generally, please feel free to tell the instructor what is working well, and what is not working as well during the semester.

Academic Integrity and Profession Conduct:

Academic misconduct by a student shall include, but not be limited to, disruption of classes; threatening an instructor or fellow student in an academic setting; giving or receiving of unauthorized aid on examinations or in the preparation of notebooks, themes, reports or other assignments; knowingly misrepresenting the source of any academic work; unauthorized changing of grades; unauthorized use of University approvals or forging of signatures; falsification of research results; plagiarizing of another's work; violation of regulations or ethical codes for the treatment of human and animal subjects; or otherwise acting dishonestly in research.

The issue of digital plagiarism has raised concerns about ethics, student writing experiences, and academic integrity. The student will asked to submit some assignments in a digital format so that the paper can be checked against Web pages and databases of existing papers. Although the student may never have engaged in *intentional* plagiarism, many students incorporate sources without citations. This constitutes plagiarism and cannot be treated differently than intentional plagiarism. The KU Writing Center offers a student writing guide with links to useful information regarding plagiarism and how to avoid it (http://writing.ku.edu/writing-guides). If the student is not sure how to use a source in a document, please visit http://writing.ku.edu/paraphrase-and-summary or ask the instructor.

Student Access Center:

The Student Access Center (SAC) coordinates academic accommodations and services for all eligible KU students with disabilities. If a student has a disability for which they wish to request accommodations and have not contacted SAC, please do so as soon as possible. SAC is located in 22 Strong Hall and can be reached at 785-864-4064 (V/TTY). Information about their services can be found at access.ku.edu. Please contact the instructor privately regarding needs in this course.

Other Notes:

If the student has trouble with the reading materials, lectures, or with the pace of the class, please contact the instructor as soon as they are aware of the difficulty. The instructor will work with the student to improve their study skills or to overcome particular obstacles that may interfere with optimal performance in this class. Please talk to the instructor early in the course if there is a suspect or anticipate difficulty in this class!

As a premier international research university, the University of Kansas is committed to an open, diverse and inclusive learning and working environment that nurtures the growth and development of all. KU holds steadfast in the belief that an array of values, interests, experiences, and intellectual and cultural viewpoints enrich learning and our workplace. The promotion of and support for a diverse and inclusive community of mutual respect require the engagement of the entire university. All members of our campus community must accept the responsibility to demonstrate civility and respect for the dignity of others. Expressions or actions that disparage a person's or group's race, ethnicity, nationality, culture, gender, gender identity, religion, sexual orientation, age, veteran status, or disability are contrary to the mission of the University and are not acceptable in my classroom.

Students shall not be penalized for absence from regularly scheduled class activities that conflict with mandated religious observances (USRR 2.2.3). In cases of conflicts between class activities and mandated religious observances, the student is responsible for initiating discussion with the instructor to reach a mutually acceptable solution. **If the student anticipates missing class because of a religious observance, please contact the instructor as soon as possible so that alternative arrangements can be made.**

Additional Resources and Policy Information for Students:

In addition to the policies noted above, the following links and resources may be helpful to the student for this course, as well as for others they may be taking. If there are any questions or concerns about any of these policies, statements, or resources, please let the instructor know. In addition, please visit the Student Resources website (KU Academic Success) for additional policies and resources.

- Change of Grade Policy and USRR, Section 3: Change of Grade
- Code of Student Rights and Responsibilities
- KU Policy on Commercial Notetaking
- KU Statement on Diversity and Inclusion
- Mandatory Reporting (Civil Rights & Title IX)
- Nondiscrimination, Equal Opportunity, and Affirmative Action
- Racial and Ethnic Harassment Policy
- Sexual Harassment
- Counseling and Psychological Services
- Kansas Board of Regents Statement on Freedom of Expression
- Student Support and Case Management

Course Schedule:

Date	Topic
W - Aug 28	Basic Statistics
W - Sep 4	Frequency Analysis
W - Sep 11	L-Moments/ Parameter Estimation
W - Sep 18	Hypothesis Testing
W - Sep 25	Nonparametric Testing
W - Oct 2	Regression
W - Oct 9	Timeseries Analysis (Basic)
W - Oct 16	Timeseries Analysis (Harmonics)
W - Oct 23	**Midterm Exam**
W - Nov 6	Principle component analysis
W - Nov 13	Data Assimilation
W - Nov 20	Hydrologic forecasting and Verification
W - Nov 27	Thanksgiving Break
W - Dec 4	Machine Learning
W - Dec 11	Project Presentations
W - Dec 18	**Final Project Due by 11:59pm**

The schedule is subject to change throughout the semester.