



Course Syllabus: Environmental Statistics - STAT 310

Division	Computer, Electrical and Mathematical Sciences & Engineering
Course Number	STAT 310
Course Title	Environmental Statistics
Academic Semester	Fall
Academic Year	2019/2020
Semester Start Date	08/25/2019
Semester End Date	12/10/2019
Class Schedule (Days & Time)	09:00 AM - 10:30 AM Mon Tue

Instructor(s)				
Name	Email	Phone	Office Location	Office Hours
Ying Sun	ying.sun@kaust.edu.sa	+966128080644	4214, 1, Al-Khawarizmi (bldg. 1)	Office Hours: Room 4124 Building 1, T 10:15 AM-11:45 AM or by appointment.

Teaching Assistant(s)	
Name	Email

Course Information	
Comprehensive Course Description	This course is to provide a systematic advanced treatment of areas of current interest in the statistical theory and methods for environmental data. Learn, discuss and apply statistical methods to important problems in environmental sciences, with a focus on understanding and quantifying changes in environmental sciences or problems of this nature.
Course Description from Program Guide	This course is an introduction to statistical methods for environmental data, with a focus on applications. Learn, discuss and apply statistical methods to important problems in environmental sciences. Topics include sampling, capture-recapture methods, regression, toxicology, risk analysis, time series, spatial statistics and environmental extremes.
Goals and Objectives	Environmental sampling and modeling: sampling methods, capture-recapture methods, multiple regression, toxicology, risk analysis, quantile regression. Time series analysis: stationary processes, autocovariances and spectral analysis, linear time-invariant filtering, autoregressive moving average (ARMA) processes, time series modeling, and forecasting. Monitoring, modeling and forecasting change: statistical monitoring methods for the environmental system, change-point analysis, statistical methods for nonstationarity.
Required Knowledge	Statistical inference, calculus, linear algebra, linear regression
Reference Texts	Vic Barnett (2004), Environmental Statistics: Methods and Applications. (eBook) P. J. Brockwell and R. A. Davis (1991), Time Series: Theory and Methods, second edition. (eBook) R. H. Shumway and D. S. Stoffer (2006), Time Series Analysis and Its Applications: With R Examples, second edition. (eBook)
Method of evaluation	40.00% - Course Project(s) 30.00% - Presentation 30.00% - Homework /Assignments

Nature of the assignments	Homework will complement the work in class, generally due every other week. The required computer package for this class is R. Example code and datasets will be posted on the class webpage.
Course Policies	No late homework accepted unless prior arrangements have been made. Staple the pages together (we are not responsible for lost pages). Submit the problems in order, making sure that the computer output and discussion are placed together. Do not put the computer output at the end of homework; raw output is not acceptable. Make it clear what parts of the output are relevant and show how they answer the questions posed. You are encouraged to work together on the homework, but collaboration with classmates is strictly limited to discussing problems, not writing them up or sharing R code.
Additional Information	

Tentative Course Schedule

(Time, topic/emphasis & resources)

Week	Lectures	Topic
1	Mon 08/26/2019 Tue 08/27/2019	Introduction
2	Mon 09/02/2019 Tue 09/03/2019	Environmental sampling 1
3	Mon 09/09/2019 Tue 09/10/2019	Environmental sampling 2
4	Mon 09/16/2019 Tue 09/17/2019	Risk assessment
5	Mon 09/23/2019 Tue 09/24/2019	Models for environmental data
6	Mon 09/30/2019 Tue 10/01/2019	Quantile regression
7	Mon 10/07/2019 Tue 10/08/2019	Stationary time series and exploratory time series analysis
8	Mon 10/14/2019 Tue 10/15/2019	Prediction of stationary processes
9	Mon 10/21/2019 Tue 10/22/2019	Estimation of stationary processes
10	Mon 10/28/2019 Tue 10/29/2019	Stationary ARMA processes
11	Mon 11/04/2019 Tue 11/05/2019	Spectral analysis 1
12	Mon 11/11/2019 Tue 11/12/2019	Spectral analysis 2
13	Mon 11/18/2019 Tue 11/19/2019	State-space models
14	Mon 11/25/2019 Tue 11/26/2019	Various time series models
15	Mon 12/02/2019 Tue 12/03/2019	Advanced topics
16	Mon 12/09/2019 Tue 12/10/2019	Course project

Note

The instructor reserves the right to make changes to this syllabus as necessary.