

Cover Sheet: Request 14333

STA 4XXX Statistical Computing in R

Info

Process	Course New Ugrad/Pro
Status	Pending at PV - University Curriculum Committee (UCC)
Submitter	Michael Daniels daniels@ufl.edu
Created	10/10/2019 1:59:22 PM
Updated	11/17/2019 2:29:09 PM
Description of request	This is the third of three new statistics courses needed for the new data science major

Actions

Step	Status	Group	User	Comment	Updated
Department	Approved	CLAS - Statistics 011623000	Michael Daniels		10/11/2019
No document changes					
College	Conditionally Approved	CLAS - College of Liberal Arts and Sciences	Joseph Spillane	The College Curriculum Committee conditionally approves this request, with the following: add "in R" to the course title and transcript title; 2) add a 15th week to the weekly schedule of courses	11/16/2019
No document changes					
Department	Approved	CLAS - Statistics 011623000	Michael Daniels	made the requested changes except for adding 'in R' to transcript title due to character limits	11/16/2019
No document changes					
College	Approved	CLAS - College of Liberal Arts and Sciences	Joseph Spillane		11/17/2019
No document changes					
University Curriculum Committee	Pending	PV - University Curriculum Committee (UCC)			11/17/2019
No document changes					
Statewide Course Numbering System					
No document changes					
Office of the Registrar					
No document changes					
Student Academic Support System					
No document changes					
Catalog					
No document changes					
College Notified					
No document changes					

Course|New for request 14333

Info

Request: STA 4XXX Statistical Computing in R

Description of request: This is the third of three new statistics courses needed for the new data science major

Submitter: Michael Daniels daniels@ufl.edu

Created: 12/6/2019 9:52:52 PM

Form version: 4

Responses

Recommended Prefix STA

Course Level 4

Course Number XXX

Category of Instruction Advanced

Lab Code None

Course Title Statistical Computing in R

Transcript Title Statistical Computing

Degree Type Baccalaureate

Delivery Method(s) On-Campus

Co-Listing No

Effective Term Fall

Effective Year 2020

Rotating Topic? No

Repeatable Credit? No

Amount of Credit 3

S/U Only? No

Contact Type Regularly Scheduled

Weekly Contact Hours 3

Course Description Overview of computational statistics and how to implement the methods in R. Topics include Monte Carlo methods in inference, bootstrap, permutation tests, and Markov chain Monte Carlo (MCMC) methods.

Prerequisites STA 3XXX (Programming with Data in R) & STA 4210 & STA 4322 & MAS 4XXX (Linear Algebra for Data Science)

Co-requisites N/A

Rationale and Placement in Curriculum This will be a core course for the new data science major (within statistics) and an elective for the statistics major. This course will introduce majors to the essential computational tools for understanding large and complex data that has arisen in fields from biology to finance to astronomy.

Course Objectives - Implement Monte Carlo and Markov chain Monte Carlo methods in R to analyze data

- Implement the bootstrap in R to appropriately account for uncertainty in statistical inference
- Conduct permutation tests as alternatives to parametric tests in R
- Explain the theoretical underpinnings of these computational approaches

Course Textbook(s) and/or Other Assigned Reading Rizzo, M. (2019) Statistical computing with R.

2nd edition, CRC Press

Weekly Schedule of Topics Week 1

- Quick review of R

Week 2

- Methods for generating random variables
- Inverse transform
- Rejection sampling
- Multivariate sampling

Week 3

- Visualization of multivariate data
- surface plots
- contour plots
- principal components analysis

Week 4

- Monte Carlo
- Monte Carlo integration

Week 5

- Monte Carlo (continued)
- Importance sampling

Week 6

- Monte Carlo (continued)
- Monte Carlo methods for inference
- Exam 1

Week 7

- Resampling methods
- Bootstrap
- Bootstrap confidence intervals

Week 8

- Resampling methods (continued)
- Applications of resampling

Week 9

- Permutation tests
- Exam 2

Week 10

- Markov Chain Monte Carlo
- Introduction

Week 11

- Markov Chain Monte Carlo (continued)
- Metropolis-Hastings

Week 12

- Markov Chain Monte Carlo (continued)
- Gibbs sampling

Week 13

- Markov Chain Monte Carlo (continued)
- monitoring convergence

Week 14

- Markov Chain Monte Carlo (continued)
- Hamiltonian Monte Carlo

Week 15
- Review

Grading Scheme Grades will be based on weekly homeworks and three in class exams.

Homeworks	10%
Exam 1	30%
Exam 2	30%
Exam 3	30%

Grades will be assigned as follows: 92.5-100, A; 90.0-92.4, A-; 87.5-89.9, B+; 82.5-87.4, B; 80.0-82.4, B-; 77.5-79.9, C+; 72.5-77.4, C; 70.0-72.4, C-; 67.5-69.9, D+; 62.5-67.4, D; 60.0-62.4, D-; 0-59.9, F
The numeric scores will be rounded to the nearest tenth.

Instructor(s) to be determined

Attendance & Make-up Yes

Accomodations Yes

UF Grading Policies for assigning Grade Points Yes

Course Evaluation Policy Yes