



ROLLINS
SCHOOL OF
PUBLIC
HEALTH
EMORY

DEPARTMENT: Biostatistics & Bioinformatics

COURSE NUMBER: 723

SECTION NUMBER:

SEMESTER: Spring 2020

CREDIT HOURS: 4

COURSE TITLE: Stochastic Processes

INSTRUCTOR NAMES Lance Waller, Andrew Hill

INSTRUCTOR CONTACT INFORMATION

EMAIL: lwaller@emory.edu, anhill@emory.edu

PHONE: 404 727 1057 (Waller)

SCHOOL ADDRESS OR MAILBOX LOCATION: GCR 220

OFFICE HOURS

Dr. Waller: M, W 1-2 or by appointment

Dr. Hill: Immediately after class or by appointment.

COURSE DESCRIPTION (3-4 Sentences)

This course serves as an introduction to stochastic processes, with an emphasis on applications to biostatistics.

Bios 710 is a prerequisite. Familiarity with multivariable calculus and linear algebra is assumed. Familiarity with R will be useful, but not essential.

EVALUATION

2 projects: 30% each

4 Homework sets: 10% each

ACADEMIC HONOR CODE

The RSPH requires that all material submitted by a student in fulfilling his or her academic course of study must be the original work of the student.

LEARNING OBJECTIVES OR COMPETENCIES OF THE COURSE

Topics to be covered include:

- Branching processes and extinction probabilities
- Birth-death processes
- Poisson processes
- Stochastic processes in infectious disease models (SIR, SEIR)
- Markov chains
- Markov chain Monte Carlo (MCMC)
 - importance, Hastings-Metropolis, Gibbs sampling
- MCMC applications
 - SIR models
 - Gillespie algorithm
 - approximate Bayesian computing (ABC)

LEARNING OBJECTIVES OR COMPETENCIES FOR THE DEPARTMENT OR PROGRAM TO WHICH THE COURSE CONTRIBUTES

The degree programs in Biostatistics prepare the student to be an integral member of an interdisciplinary team for conducting medical and public health research. Learning objectives include:

- Apply statistical theory to medical and public health problems
- Assist in identifying appropriate statistical designs for medical and public health research
- Conduct power analyses and select appropriate sample sizes
- Use a variety of statistical and mathematical computer packages
- Conduct appropriate statistical analyses
- Communicate the results of the study both orally and in writing to senior statisticians and other investigators

In addition to these learning objectives, upon completion of the PhD degree, the graduate will be able to:

- Develop new statistical theory as needed to address public health or medical problems
- Apply new and existing statistical theory to a broad range of complex medical or public health problems
- Conduct complex statistical analyses for a broad range of applications