College of Public Health & Health Professions

Course Syllabus

PHC 6937: Stochastic epidemic modelling and statistical inference

Spring 2013

Wednesdays 9:35 a.m. – 10:25 a.m., Dauer Hall, Room 342

Instructor Information

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Course Overview

The student will learn theory and applications of modelling epidemic outbreaks and statistical inference for such. The focus will however be on methodology. The theory involves deterministic models, usually presented with sets of differential equations, and stochastic models. Large population properties will be derived using probabilistic methods such as central limit theory, branching process theory, theory for population processes, l random graph theory and coupling. Statistical methods will also be presented using e.g. martingales, counting processes and the likelihood theory.

Models that will be presented include simple mass action models butut also models in structured populations such as household epidemic models, multi type epidemics and network models. Inference methods both for final size and temporally collected data will be presented. Particular focus will be given to the basic reproduction number, the critical vaccination coverage and measures for vaccine efficacy.

Prerequisites

Suitable knowledge in mathematics, probability, stochastic processes and statistical inference. At least a bachelor in these subjects. I am thinking of second year master students and PhD students??

Additional helpful background

Differential Equations (including nonlinear theory), Markov process theory.

Course Objectives and/or Goals

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

- Formulate and analyze stochastic epidemic models for specific purposes
- Derive and use inferential methods for models mentioned above
- Interpret and understand results both from probabilistic and statistical analyses
- Be aware of assumptions and limitations of methods and critically examine published work

Course Materials

H. Anderson and T. Britton (2000): *Stochastic epidemic models and their statistical analysis*. Springer Lecture notes in Statistics 151.
Britton, T.: Stochastic epidemic models: a survey. (2010) Math. Biosci, **225**, 24-35. The paper contains an error, see http://www2.math.su.se/~tomb/publ.html
T. Britton (2013) Course lecture notes. Will be available on web.

Reference texts:

Anderson R. M. and May R. M. (1992). *Infectious diseases of humans; dynamic and control*. Oxford: Oxford University Press.
Diekmann O., Heesterbeek, J.A.P. and Britton, T. (2012). *Mathematical tools for understanding infectious disease dynamics*. Princeton UP.

Course Requirements/Evaluation/Grading

Students are responsible for all course material, including reading required materials prior to each class. Failure to complete assignments will result in a failing grade.

The assessment will include class participation, three sets of assignments during the course, and one project work performed in groups of 3-4 presented both written and orally. Class participation will include weekly attendance and participation in discussions.

Class participation: 10%
Assignments: 60%
Projects: 30%

The grading scale for this course consists of the standard scale, including minus grades, below. The conversion factors for grade point values that are assigned to each grade are also included (in parentheses):
93% - 100% = A (4.00)
90% - 92% = A- (3.67)
87% - 89% = B+ (3.33)
83% - 86% = B (3.00)
80% - 82% = B- (2.67)
77% - 79% = C+ (2.33)
73% - 76% = C (2.00)
70% - 72% = C- (1.67)
67% - 69% = D+ (1.33)
63% - 66% = D (1.00)
60% - 62% = D- (0.67)
Below 60% = E (0.00)

Tentative Outline

#	Dates	Topic	Reference in And-Bri
1	Jan 9	Introduction to epidemic models	Ch 1
2	16	The standard stochastic epidemic model (SSEM)	2.1,2.2,2.4
3	23	General stochastic and deterministic epidemic models	2.3+1.3
4	30	Branching process approximation	3.3 + LN
5	Feb 6	Coupling	3
6	13	Threshold results	4
7	20	Structured populations: households and multi type	6.1-6.3
8	27	Structured populations: networks	7 + LN
	Mar 6	Spring Break	No class
9	13	Inference methods: SSEM	9
10	20	Inference for temporal data	9
11	27	Inference for final size data	10
12	Apr 3	Inference for extensions	11 + LN
13	10	Modelling and estimation of vaccine efficacy	12
14	17	Catch up and course summary	
15	24	Project presentations *LONGER TIME THIS DAY*	

LN= Lecture Notes (of course applicable always but in particular were noted)

Statement of University's Honesty Policy (cheating and use of copyrighted materials)

Academic Integrity – Students are expected to act in accordance with the University of Florida policy on academic integrity (see Student Conduct Code, the Graduate Student Handbook or this web site for more details: **www.dso.ufl.edu/judicial/procedures/academicguide.php**).

Cheating, lying, misrepresentation, or plagiarism in any form is unacceptable and inexcusable behaviour.

We, the members of the University of Florida community,
pledge to hold ourselves and our peers to the
highest standards of honesty and integrity.

Policy Related to Class Attendance and Late or Missed Assignments:

Attendance of all class sessions is required. Please see the instructor as early as possible regarding possible absences. All assignments need to be handed in on time. Grading will penalize late assignments. Missed assignments will receive a zero score. Personal issues with respect to class attendance or fulfilment of course requirements (assignments, final presentation, class discussion) will be handled on an individual basis.

Accommodations for Students with Disabilities

If you require classroom accommodation because of a disability, you must first register with the Dean of Students Office (http://oss.ufl.edu/). The Dean of Students Office will provide documentation to you, which you then give to the instructor when requesting accommodation. The College is committed to providing reasonable accommodations to assist students in their coursework. We all learn differently: however, if you have experienced problems in university classes with writing, in-class exams, understanding or concentrating in class; please talk to us or access a learning or education testing resource at the University or in another professional setting.

Counselling and Student Health

Students may occasionally have personal issues that arise in the course of pursuing higher education or that may interfere with their academic performance. If you find yourself facing problems affecting your coursework, you are encouraged to talk with an instructor and to seek confidential assistance at the University of Florida Counselling Center, 352-392-1575, or Student Mental Health Services, 352-392-1171. Visit their web sites for more information: http://www.counsel.ufl.edu/ or http://www.health.ufl.edu/shcc/smhs/index.htm#urgent

The Student Health Care Center at Shands is a satellite clinic of the main Student Health Care Center located on Fletcher Drive on campus. Student Health at Shands offers a variety of clinical services, including primary care, women's health care, immunizations, mental health care, and pharmacy services. The clinic is located on the second floor of the Dental Tower in the Health Science Center. For more information, contact the clinic at 392-0627 or check out the web site at: www.health.ufl.edu/shcc

Crisis intervention is always available 24/7 from:
Alachua County Crisis Center: (352) 264-6789.

BUT – *Do not wait until you reach a crisis to come in and talk with us. We have helped many students through stressful situations impacting their academic performance. You are not alone so do not be afraid to ask for assistance.*

Class Demeanor Expected by the Professor (late to class, cell phones):

Students are expected to show up for class prepared and on time. Cell phones are to be silenced during class unless there is an emergency, in which case please inform the instructor.