BIOSTATISTICS 601 (SECTION 2):
Probability & Distribution Theory
(4 Credit course with 4 hour/week of classroom lectures)
Fall 2015
Tuesdays, 10:10 am - 12 noon, 1152 SPH II

INSTRUCTOR:
Thomas Braun
M4063 SPH II
tombraun@umich.edu
734-936-9844
Office Hours: Mondays 10:00am – 11:30am or by appointment

INSTRUCTOR OF SECTION 1:
Ananda Sen
2539 SPH II
anandas@umich.edu
Office Hours: Tuesdays 3:30pm – 5:00pm or by appointment

GRADUATE TEACHING ASSISTANT (GSI):
Tianyu Zhan
Office Hours: Wednesdays 2:00pm – 4:00pm
M1236 SPH II (9/23, 10/28, & 11/18 only)
1629 SPH I (all other dates)

COURSE DESCRIPTION:
This is the first part of a two-part course that deals with the theoretical foundation of statistics necessary for the deep understanding of applied statistical methods.

COURSE OBJECTIVES:
The course broadly covers the basic concepts of probability; properties of a random variable; expectation, variance, covariance; distribution functions; bivariate, marginal, and conditional distributions; and notion of large-sample behavior of a sequence of random variables. The course also introduces some key discrete and continuous distributions commonly used for modeling data.

PREREQUISITES:
All students in this class are expected to have completed three terms of undergraduate calculus or have obtained prior approval from the Biostatistics Department. The prerequisite is strictly enforced.

COURSE WEBSITE:
Homework assignments, lecture notes, and other handouts can all be found on CANVAS at https://umich.instructure.com

COURSE READING MATERIALS:
Required Text: Statistical inference, 2nd edition by G Casella and RL Berger (Chapters 1-5)
(Duxbury: Thomson Learning Inc, 2002)
DATES WITHOUT LECTURE:
Tuesday, October 20 (Fall Semester Break)
Thursday, November 26 (Thanksgiving)
Others cancellations may occur at short notice due to travel or personal reasons

HOMEWORK ASSIGNMENTS:
There will be several assignments over the semester covering both theoretical material as well as applications of the theory. Problems will generally be assigned from the book although there may be occasional supplemental problem assigned as homework. While it is permitted to discuss various aspects of an assignment problem with the instructor or the grader, or another student in your study group, your solution to the assignment must necessarily be your work in its entirety. Any form of copying from another person’s work will be construed as violation of academic conduct and will be subject to appropriate disciplinary actions as per university guidelines. Your answers should be submitted on standard size (8.5” by 11”) paper, with the sheets stapled together provided there is more than one page.

Assignments will generally be handed out on Thursdays and due the following Thursday. Late assignments (without prior approval) will be assessed a penalty of 20% for each day late, so you are encouraged to submit all homework on time. Please make arrangements for another student to submit your assignment if you are unable to attend a class on the date of submission. Certainly emergencies in life appear that may cause your homework to be late; these are acceptable excuses as long as you communicate with me immediately!

EXAMINATIONS:
The midterm will take place tentatively from 10am-12noon on Thursday, October 29.
The final examination will take place from 4-6pm on Thursday, December 17. There is no alternate time for this exam – plan your travel accordingly!
Both tests will be held in our lecture classroom unless mentioned otherwise. Both tests will be closed book; no notes or textbooks are allowed. Make-up exams are not held except in extreme situations and when supported by proper official documentation.

GRADING:
Your course grade will be based on the following weighting scheme:
- Homework: 20%
- Midterm Exam: 30%
- Final Exam: 30%
- Attendance & Participation: 20%

There is no fixed grading scale (curve) for this course, and conversion from your percentage score to letter grades will be carried out at the end of the course.

OUTLINE OF LECTURES:
Chapter 1
• Brief review of combinatorial analysis
• Sample space, events, and set operation
• Axioms of probability
• Properties of probability function
• Probabilities in finite sample space
• Conditional probability and independence
• Random variables
• Distribution, density, expectation, and variance

Chapter 2
• Functions of a random variable
• Moments and moment generating functions
• Dominated convergence theorem, interchanging integration and differentiation

Chapter 3
• Examples of discrete distributions
• Examples of continuous distributions

Chapter 4
• Joint distribution functions
• Conditional distributions and independence
• Expectation, covariance, and correlation coefficient
• Distributions of functions of random variables
• Important inequalities

Chapter 5
• Distributions of sample statistics; order statistics
• Modes of convergence: almost sure, in probability, and in distribution
• Weak and strong laws of large numbers
• Delta method

CLASSROOM EXPECTATIONS/ETIQUETTE:
Class attendance is expected and will be monitored informally. Use of laptops or smart phones will not be allowed in class without the instructors’ permission. University policy specifies that students are responsible for all official correspondence sent to their standard University e-mail address. Students should check this account frequently. Students will be expected to engage and participate fully in lecture, as much of our lecture time will actually be spent discussing problems and questions that I pose.

COURSE COMPETENCIES:
After completing this class, students are expected to be able to attain the following competencies (either partially or fully):
(a) Describe the roles biostatistics serves in the discipline of public health;
(b) Describe basic concepts of probability, random variation and commonly used statistical probability distributions;
(c) Describe preferred methodological alternatives to commonly used statistical methods when assumptions are not met;
(d) Distinguish among the different measurement scales and the implications for selection of statistical methods to be used based on these distinctions:

(e) Apply descriptive techniques commonly used to summarize public health data;

(f) Apply common statistical methods for inference;

(g) Apply descriptive and inferential methodologies according to the type of study design for answering a particular research question;

ACADEMIC INTEGRITY:
The faculty and staff of the School of Public Health believe that the conduct of a student registered or taking courses in the School should be consistent with that of a professional person. Students must show courtesy, honesty, and respect toward faculty members, guest lecturers, administrative support staff, community partners, and fellow students. Similarly, students should expect faculty to treat them fairly, showing respect for their ideas and opinions, and striving to help them achieve maximum benefits from their experience in the School. Student academic misconduct refers to behavior that may include plagiarism, cheating, fabrication, falsification of records or official documents, intentional misuse of equipment or materials (including library materials), and aiding and abetting the perpetration of such acts. Possible consequences of misconduct include: requirement to redo the assignment, receiving a failing grade for the assignment, receiving a reduced grade for the course, receiving a failing grade for the course, a requirement for formal counseling or remediation for the student, and/or dismissal from the SPH. The full SPH Code of Academic Integrity can be found at http://www.sph.umich.edu/academics/policies/conduct.html.

STUDENT WELL-BEING:
SPH faculty and staff believe it is important to support the physical and emotional well being of our students. If you have a physical or mental health issue that is affecting your performance or participation in any course, and/or if you need help connecting with University services, please contact the instructor or the Office of Academic Affairs. Please visit http://www.sph.umich.edu/students/current/#wellness for more information.

STUDENT ACCOMMODATIONS:
Students should speak with their instructors before or during the first week of classes regarding any special needs. Students can also visit the Office of Academic Affairs for assistance in coordinating communications around accommodations. Students seeking academic accommodations should register with Services for Students with Disabilities (SSD). SSD arranges reasonable and appropriate academic accommodations for students with disabilities. Please visit http://ssd.umich.edu/accommodations for more information on student accommodations. Students who expect to miss classes, examinations, or other assignments as a consequence of their religious observance shall be provided with a reasonable alternative opportunity to complete such academic responsibilities. It is the obligation of students to provide faculty with reasonable notice of the dates of religious holidays on which they will be absent. The complete University of Michigan policy can be found at http://www.provost.umich.edu/calendar/religious_holidays.html#conflicts.