# University of Texas Graduate School of Biomedical Sciences at Houston
## GS02 1072 - Statistics for Medical Physicists New course - Fall 2021

**Course Description:** The aim of this course is to introduce the main concepts and methods in biostatistics that are used to analyze biomedical data, with a particular emphasis on their applications and relevance to medical physics.

**Learning objectives:**
- To review the general approach in applied statistical methodology and applicability in medical physics literature and various areas of medical physics research
- To enhance the understanding the fundamental statistical concepts and principles
- To gain practical experience in how to identify, implement and interpret the appropriate statistical methods using statistical software in medical physics applications

**Time and Location**: Tuesday & Thursday 1:30 to 2:30, DI-CPB5.3312 Classroom

**Primary Textbook**: Fundamentals of Biostatistics, 7th edition by Bernard Rosner (buying book is not necessary, notes will be provided)

**Course Instructor:**

Sanjay Shete, PhD
sshete@mdanderson.org

**Software**: The open source statistical software R.

**Important**: To get the most from this course students should read the designated chapters, do the homework assignment to master the basic definitions and concepts and make preparations for next lecture. Usually you should expect to study at least 4-6 hours per week outside of class for this course.
You are expected to attend lectures. Attending lectures is not a substitute for reading the book, nor is attending the lectures sufficient to fully understand the material.

**Grading:** Grades are determined by homework (60%) and a final project report (40%), and a project presentation. You can access the internet to search for relevant materials. However, any behavior requesting or obtaining external help from others are prohibited. The topic of the final project can be either self-initiated after approval from instructor or assigned by instructor. The final letter grades are based on a modified curve. Grading disputes need to be submitted in writing within a week from receiving the grades.

**Make up exam policy:**
There will not be any make up exam or presentation.

**The Honor System:** Students are expected to adhere to the Student Conduct and Discipline. A student found to be in violation of the Conduct will receive an F for the course, in addition to any penalties may be imposed by GSBS.

**Tentative Course Outline**
This list is tentative and subject to change. No class during Thanksgiving week when students can work on the final project and the presentation.

| Lecture # | Lecture Title |
|---|---|
| 1/2 | Introduction + Study design |
| 3/4 | Probability and conditional probability, discrete random variables |
| 5/6 | Continuous probability: normal distribution and more |
| 7/8 | Confidence interval estimation, Bayesian statistics, diagnostic testing |
| 9/10 | Hypothesis testing 1: general concepts, one-sample inference, power calculation and sample size justification |
| 11/12 | Hypothesis testing 2: two sample inference, equal variance, relationship between hypothesis testing and confidence interval |
| 13/14 | Hypothesis testing 3: categorical analysis and non-parametric methods |
| 15/16 | Regression: model fitting, inference and goodness-of-fit |
| 17/18 | Analysis of variance, mixed-effect regression, model selection |
| 19/20 | Survival analysis + Advanced statistical approaches |
| 21/22 | Collaboration with biostatistician + Review |
| 23/24 | Longitudinal data analyses |
| 25/26 | Classification and Regression Tree |
| 27 | Final Project Presentation |