

# Syllabus – Fall 2015

## Power and Sample Size

(Short Course on Statistical Power Analysis)

### Washington University School of Medicine

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Meeting Dates and Times: Taylor Avenue Building, from 9:00am-5:00pm on Saturday October 17 and October 24, 2015.

#### **Course Overview:**

This short one-hour credit course will provide an overview for statistical power computations for a variety of experimental and epidemiological study designs including single sample designs, two-sample designs, cohort designs, case-control designs and various other experimental designs based on the Analysis of Variance model. The concepts of statistical power, statistical precision, sample size and effect size will be reviewed. Other issues relating to the balance of scientific interests and statistical design and analysis as related to power will also be presented. Various ways that researchers can present power/precision arguments in their grant applications including viewing statistical power as a function of sample and effect sizes will be covered. Statistical power computations will be illustrated via various statistical power software including free online web applets as well as G\*Power 3. Participants will also be expected to perform various power computation exercises throughout the class; as a practical extension, participants will also be encouraged to bring a power calculation problem they are currently considering in their research to work on as an example in the class.

**Course Objectives:** After this course participants will be able to:

1. Understand the underlying principles of statistical power;
2. Understand the fundamental components of power calculations for basic study designs involving single and multiple proportions, single and multiple means and correlations as well as ANCOVA and multiple regression models;
3. Understand the context of statistical power calculations in the broader perspective of scientific studies with specific attention given to how power calculations can inform design and research refinement;
4. Understand the types of power analyses: the pros, cons and pitfalls of common approaches
5. Be able to perform simple power calculations manually and with the assistance of online applets and power software
6. Be able to present basic power information in grant applications and use power and sample size calculations as the basis of argument in support of study design, feasibility and testing.

#### **Course Materials:**

**Recommended Text:** Power Analysis for Experimental Research by R. Barker Bausell and Yu-Fang Li [© Cambridge Press, 2002]

**Papers:** Several research articles appearing in various medical and statistical articles will be discussed throughout the class.

**Software:** Various online web applets and freeware for statistical power and sample size computations including PS.exe (free download from:

<http://biostat.mc.vanderbilt.edu/twiki/bin/view/Main/PowerSampleSize>), Russ Lenth's Power and Sample Size webpage: <http://www.stat.uiowa.edu/~rlenth/Power/> will be illustrated in the course.

The free statistical sample size/power software G\*Power **version 3.1.9.2** will be used in the class available from <http://www.psych.uni-duesseldorf.de/abteilungen/aap/gpower3/> .

**Evaluation:** Participants will be encouraged to practice power calculations throughout the short course and class participation will account for 40% of the final grade. An initial homework assignment will be assigned on Saturday October 19 and will account for 30%. A final HW/Computer Lab will be given on the second Saturday afternoon will account for the remaining 30% of the evaluation. Grades will be determined on a standard 10 point scale (i.e. 90-100 =A; 80-89.9 =B; etc.).