Course Syllabus

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ANAT 6600 – Experimental Design and Research Methods

Course Director
John A. Thompson, PhD
Dept of Neurosurgery
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Additional Lecturers

Tom Finger, Ph.D. tom.finger@cuanschutz.edu (mailto:tom.finger@ucdenver.edu)

John Caldwell, Ph.D. John.Caldwell@cuanshutz.edu (mailto:John.Caldwell@ucdenver.edu)

Location & Time

Lectures and Labs will take place in **Ed 2 – South, Room 2206**. The class meets on Mondays from **2 pm – 5 pm** except for the last class on Oct. 14, which will meet between **1 pm - 4 pm**.

Credits

Experimental Design and Research Methods (ANAT 6600) is a one-credit hour course that fulfills a core requirement of the MS Modern Human Anatomy program. Each class period consists of a mixture of interactive lectures, hands-on ('lab') activities, and projects designed to allow you to apply each day's material.

In addition, this course will provide training in skills required to complete the MHA program – specifically, the Capstone Project - as well as being essential for your future careers.

Prerequisites & Enrollment Restrictions

Students must be enrolled in the Masters of Science in Modern Human Anatomy program, or have special permission from the course director. There are no prerequisites for this course.

Course Description & Learning Objectives

We live in a research-driven society! On a daily basis, we with research-related headlines in newspapers, magazines, and even blogs. However, not all published research is accurate. How can you tell fact from fiction? In other words, how can be an informed consumer?

In this course, you will foster and apply strategies that enable critical evaluation of any published research (including basic, clinical, and educational), as well as develop the skills necessary to conduct and appropriately analyze your own research data.

By the end of this course, students will be able to:

1. *Design* empirically-sound research studies, including appropriate experimental controls
2. *Analyze* anatomical research results
3. *Compare and contrast* the three types of research claims, and be able to identify each type of claim from real-life anatomy-specific examples
4. *Evaluate* the empirical 'soundness' of published research
5. *Develop* basic, but effective, scientific writing skills

Topics (*and associated skills*) include:

1. **Experimental Design** (*how to properly design empirical research studies*)
2. **Survey Design** (*how to create well-worded, effective survey questions*)
3. **Introduction to Descriptive Statistics** (*how to summarize a data set, including calculation of measures of 'central tendency' [mean, median and mode] and measures of 'variability' [variance, standard deviation, and standard error]*)
4. **Introduction to Inferential Statistics** (*how to analyze a data set, including 'parametric' [t-test, analysis of variance] and 'non-parametric' [chi squared, Wilcoxon rank-sum test] statistical analyses, as well as correlational statistical tests [Pearson's r, linear regression])*
5. **Effective Reading: Journal Articles** (*how to search for, critically assess, and properly reference published research*)
6. **Effective Writing: Scientific Research** (*how to write a research proposal or conference abstract, efficiently, clearly and with impact*)

Required Readings and Materials

- The first five chapters of The Mismeasure of Man by Stephen Jay Gould; this book was assigned during the summer, and the first five chapters are to be read before the first class.
- All other materials and readings will be posted on Canvas.
- You will need Microsoft Excel from Office 2016 on your laptops and you need to bring your laptops to class. See Student Responsibilities below for a link that will allow you to load Office 2016 for free for all students.

Optional Textbooks & Suggested Readings

- *Research Methods in Psychology*, 2nd edition, Beth Morling (2014). Paperback. ISBN-13: 978-0393936933 ISBN-10: 0393936937
- You do not need to buy this book. The relevant material will be provided in the lectures.
- *** Two reference copies of the textbook are available for in-house reading in the Anatomy Suite, North wing of 5th floor, Building 500, in the glass display next to the stairwell.*

Learning Management System

All course materials will be posted on Canvas, and **you will submit all assignments via Canvas** unless otherwise noted. In addition, Canvas will be used to make announcements to the class; it is your responsibility to monitor your Canvas notifications. You can access Canvas at **https://ucdenver.instructure.com/login**

Honor Code

Students are expected to abide by the Graduate School's Student Academic Honor & Conduct Code, as well as policies outlined in the MHA Student Handbook. Students are expected to act in a professional manner. Academic dishonesty, including cheating and sharing exam details, will not be tolerated.

Student Responsibilities & Expectations

- Attend all class sessions. In the case of emergency or illness, contact the instructor as soon as possible by email or phone. Late assignments will not be allowed except in the case of a documented religious event, severe illness, emergency, funeral of a family member, personal life event, or unplanned catastrophic event (as defined by the University policies). See also the Accommodation policies below.

- Bring your **laptop** to each class - with the following programs
  - Excel
    - Install Office 2016 on your laptop computers. The following website will lead you through this **http://www.ucdenver.edu/about/departments/ITS/EnterpriseComputing/office365/Pages/default.aspx (http://www.ucdenver.edu/about/departments/ITS/EnterpriseComputing/office365/Pages/default.aspx)**
  - jamovi
    - Use this link to download and install jamovi
    - **https://www.jamovi.org/download.html (https://www.jamovi.org/download.html)**
- Arrive on time. In exchange, the instructor will finish on time.
- Turn off or silence cell phones at the beginning of class.
- Ask questions!
- Pay attention in class. Use time outside of class to review or practice what you've learned.

Assessments

You will have laboratory *and* homework assignments to complete almost every week. Your final grade in the course is determined, in part, by your scores on these assignments. All laboratory assignments *must be* completed in class. Some of these assignments you will complete in groups, and some you will complete individually. The laboratory assignments are worth a total of 10 % of your final grade and, as long as you attend and participate in these in-class assignments, you will receive these points. The instructions and grading rubric for each outside-of-class homework assignment are posted on our course Canvas site. In addition to homework assignments, your final grade is dependent upon successful completion of a final project assignment (Assignment # 6) which will require you to integrate the skills and knowledge acquired within the course in order to successfully (and fully) complete this assignment. Full details will be provided in week 6, and will also be posted on our Canvas course site.

Assessment	Due Date*	Total Points	% Toward Grade
Lab # 1:	Due on 8/30	20	4%
Assignment # 1:	In-class discussion on 8/30	35	7%
Lab # 2:	Due in class 8/30	20	4%
Assignment # 2:	BEFORE class on 9/9	35	7%
Lab # 3:	Due in class 9/9	20	4%
Assignment # 3:	BEFORE class on 9/16	35	7%
Read Highlight #1:	Due in class 9/16	25	5%
Lab # 4:	Due in class 9/16	20	4%
Assignment # 4:	BEFORE class on 9/23	35	7%
Read Highlight # 2:	Due in class 9/23	25	5%
Lab # 5:	Due in class 9/23	20	4%
Assignment # 5:	BEFORE class on 10/07	35	7%
Read Highlight # 3:	Due BEFORE class 9/30	25	5%
Lab # 6:	Due in class 10/07	20	4%
Assignment # 6:	BEFORE class on 10/14	75	15%
Lab # 7:	Due in class 10/14	20	4%
Assignment # 7:	BEFORE class on 10/14	35	7%
	TOTAL	**500**	**100%**

At the end of the course, a final letter grade will be assigned according to the MHA program scale listed here. As per program policy, a minimum grade of B- is required for successful completion of the course.

Religious Accommodation Policy

Students who anticipate the necessity of being absent from class due to the observation of major religious observance must provide advance notice to the Course Director in writing, by the end of the second week of class.

Disability Accommodation Policy

Students with documented learning and/or physical disabilities should inform the Course Director as soon as possible to discuss and arrange for reasonable accommodations. All reasonable efforts will be made to accommodate students with regard to note-taking, reading assignments, and test-taking. Please contact Sherry Holden (**sherry.holden@ucdenver (mailto:sherry.holden@ucdenver)**) or Selim Ozi (**selim.ozi@ucdenver.edu (mailto:selim.ozi@ucdenver.edu)**) in the Office of Disability Resources and Services to initiate the documentation process and the specifics of the accommodation requested.

Equal Opportunity Policy

It is the goal of the University to maintain a work and study environment free of discrimination on the basis of race, color, sex, gender, marital status, religion, national origin, veteran status, handicap or age. It is a goal of this course to maintain an environment of respect for all.

Recording Policy

You are permitted to use tablets or laptop computers to take notes. In addition, you are permitted to video or audio record any or all lectures for the purpose of self-study. However, you are not permitted to use notes, tapes or other recorded data for the purposes of sale or posting on the internet.

Withdrawal Policy

Students may withdraw from this course no later than November 24 (three weeks before the end of the course). Please contact the Course Director to discuss the possibility of a course withdrawal.

Incomplete Policy

Incomplete (I) grades are not granted for low academic performance. To be eligible for an “I“ grade, you must:

- Successfully complete a minimum of 75% of the course
- Have a special circumstance(s) beyond your control that prevents you from attending class and/or completing coursework. Documentation is required.
- Make arrangements to complete missing coursework with the original instructor
- If the missing coursework is not completed within 1 year from the end of the semester in which the original course was scheduled, the “I” grade will convert to an “F” grade on your official transcript.

Remediation

In the event that a student completes the course but does not pass, remediation is permitted by the Graduate School. The type of remediation is at the discretion of the course director.

Resolution of Conflicts Policy

Good faith efforts will be made by students, faculty, and program and university administration to settle all appeals, complaints, and grievances on an informal basis. These efforts will include conferences between the persons directly involved and others who may help solve the problems. Formal conflict resolution policies are detailed in the policies and procedures of the University of Colorado Denver Graduate School.

Week	Date	Time	Topic	Instructor	ASSIGNMENT DUE	Room #
1	Monday 8/26	2 PM	LECTURE 1: Course Overview & Experimental Design I	Dr. Thompson / Dr. Caldwell	----------	Ed 2 South - RM 2206
1	Monday 8/26	3-5 PM	LAB 1: Discussion of The Mismeasure of Man. Bias and a Small-N experiment	Dr. Caldwell	----------	Ed 2 South - RM 2206
1	Monday 8/26		ASSIGNMENT: #1: Read assigned journal article for the discussion in Week 2	----------	Discussion on 8/30	----------
2	Friday 8/30	2 PM	LECTURE 2: Experimental Design II: Identify research claims, variables, and study design from 'real' journal article descriptions	Dr. Caldwell	----------	Ed 2 South - RM 2206
2	Friday 8/30	3-5 PM	LAB 2: Discussion on paper criticizing The Mismeasure of Man. Good and Bad Graphs. Analysis of Republicans and Democrats	Dr. Caldwell	----------	Ed 2 South - RM 2206
2	Friday 8/30		ASSIGNMENT: #2: Be the Researcher, design an experiment	----------	Due by 2 PM on 9/9	----------
3	Monday 9/9	2 PM	LECTURE 3: Basics of Survey Design	Dr. Thompson	----------	Ed 2 South - RM 2206
3	Monday 9/9	3-5 PM	LAB 3: Introduction to the survey-making software - Qualtrics	Dr. Thompson	----------	Ed 2 South - RM 2206
3	Monday 9/9		ASSIGNMENT #3: Make an online survey using Qualtrics	----------	Due by 2 PM on 9/16	----------
3	Monday 9/9		READING 1: before next class: "*Importance of being uncertain*"	**Week4_Reading_ImportanceOfBeingUncertain.pdf**	Prepare to discuss 9/16	----------
4	Monday 9/16	2 PM	LECTURE 4: Introduction to Descriptive Statistics	Dr. Thompson	----------	Ed 2 South - RM 2206
4	Monday 9/16	3-5 PM	LAB 4: Practice with descriptive statistics in Excel and Jamovi, including graphing data.	Dr. Thompson	----------	Ed 2 South - RM 2206
4	Monday 9/16		ASSIGNMENT #4: Summarize Data	----------	Due by 2 PM on 9/23	----------
4	Monday 9/16		READING 2: before next class: "*Significance, P*	**Week5_Reading_SignificancePvaluesTtests.pdf**	Prepare to discuss 9/23	----------

			values and t-tests"			
5	Monday 9/23	2 PM	LECTURE 5: Introduction to Inferential Statistics: Parametric	Dr. Thompson	----------	Ed 2 South - RM 2206
5	Monday 9/23	3-5 PM	LAB 5: Practice with parametric statistics in Excel and Jamovi.	Dr. Thompson	----------	Ed 2 South - RM 2206
5	Monday 9/23		NO ASSIGNMENT	----------	----------	---------- ----------
5	Monday 9/23		READING 3: before next class: "*Non-parametric tests*"	**Week6_Reading_NonParametrictests.pdf**	Prepare to discuss 9/23	---------- ----------
6	Monday 9/30	2 PM	LECTURE 6: Introduction to Inferential Statistics: Non-Parametric	Dr. Thompson	----------	Ed 2 South - RM 2206
6	Monday 9/30	3-5 PM	LAB 6: Practice with non-parametric statistics in Excel and Jamovi.	Dr. Thompson	----------	Ed 2 South - RM 2206
6	Monday 9/30		ASSIGNMENT #5: Analyze and Report Data	----------	Due by 2 PM on 10/07	---------- ----------
6	Monday 9/30		ASSIGNMENT #6: Final/Comprehensive Project	----------	Due by 2 PM on 10/14	---------- ----------
7	Monday 10/07	2 PM	LECTURE: Effective Reading: Journal articles	Dr. Finger	----------	Ed 2 South - RM 2206
7	Monday 10/07	3-5 PM	LAB: How to write and critique abstracts	Dr. Caldwell	----------	Ed 2 South - RM 2206
7	Monday 10/07		ASSIGNMENT #7: Read and Critique Scientific article	----------	Due by 2 PM on 10/14	---------- ----------
8	Monday 10/14	1 PM	LECTURE 7: Effective Writing: Scientific Research and Journal submission considerations	Dr. Caldwell	----------	Ed 2 South - RM 2206
8	Monday 10/14	2-4 PM	LAB 7: Journal article critique	Dr. Caldwell	----------	Ed 2 South - RM 2206

Course Summary:

Date	Details

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Mon Aug 26, 2019	Lab: Discussion of The Mismeasure of Man. Bias and a Small-N experiment (https://ucdenver.instructure.com/calendar?event_id=173070&include_contexts=course_429164)	2pm to 4pm
	Lecture: Course overview. Experimental Design I (https://ucdenver.instructure.com/calendar?event_id=173069&include_contexts=course_429164)	3pm to 4pm
Fri Aug 30, 2019	Assignment # 1: Reading for discussion on Aug 30 (https://ucdenver.instructure.com/courses/429164/assignments/749010)	due by 1:59pm
	Lab #1: First six coin flips description (https://ucdenver.instructure.com/courses/429164/assignments/749198)	due by 2pm
Mon Sep 9, 2019	Assignment # 2: Be the Researcher (https://ucdenver.instructure.com/courses/429164/assignments/749195)	due by 1:59pm
Mon Sep 16, 2019	Reading Highlight #1 (https://ucdenver.instructure.com/courses/429164/assignments/756456)	due by 1:30pm
	Assignment # 3a - Qualtrics (https://ucdenver.instructure.com/courses/429164/assignments/749191)	due by 1:59pm
	Assignment # 3b - jamovi (https://ucdenver.instructure.com/courses/429164/assignments/749192)	due by 1:59pm
Mon Sep 23, 2019	Reading Highlight #2 (https://ucdenver.instructure.com/courses/429164/assignments/758302)	due by 1:30pm
	Assignment 4: Descriptive Statistics (https://ucdenver.instructure.com/courses/429164/assignments/749193)	due by 1:59pm
	ANOVA Lab (https://ucdenver.instructure.com/courses/429164/assignments/758760)	due by 5pm
	Power Analysis Lab (https://ucdenver.instructure.com/courses/429164/assignments/758759)	due by 5pm
Mon Sep 30, 2019	Reading Highlight #3 (https://ucdenver.instructure.com/courses/429164/assignments/759983)	due by 1:30pm
	Inferential Stats NonPara Lab (https://ucdenver.instructure.com/courses/429164/assignments/759984)	due by 5:30pm
Mon Oct 7, 2019	Assignment #5 (https://ucdenver.instructure.com/courses/429164/assignments/749194)	due by 1:59pm
	Lab 7 in class abstract (https://ucdenver.instructure.com/courses/429164/assignments/761644)	due by 5pm
Mon Oct 14, 2019	Final Statistics Assignment (Assignment #6) (https://ucdenver.instructure.com/courses/429164/assignments/749197)	due by 1:59pm
	Critique acupuncture paper (https://ucdenver.instructure.com/courses/429164/assignments/749196)	
	Excel Lab - Descriptive stats (https://ucdenver.instructure.com/courses/429164/assignments/757433)	
	Jamovi Lab - Descriptive stats (https://ucdenver.instructure.com/courses/429164/assignments/757432)	
	Lab # 2: In-class Experimental Design (https://ucdenver.instructure.com/courses/429164/assignments/750922)	
	Lab #3: In Class Survey Lab (group) (https://ucdenver.instructure.com/courses/429164/assignments/750919)	