Sociology 514 Advanced Social Statistics
Dr. John R. Faine
WKU On Demand Section 514-970

Instructor Contact Information

e mail: john.faine@wku.edu
office: 113 Grise Hall 270-745-2291

Course Description

Advanced Social Statistics intended to be an introductory graduate-level course in the study of applied statistics for the social and behavioral sciences. Students are expected to have already completed an undergraduate basic statistics course though provisions have been made include remedial work in this course for students with no statistical background. Primary emphasis is placed on basic statistical concepts and terms, symbols, statistical interpretation including univariate statistics, describing bivariate relationships, the logic of hypothesis testing (or sometimes called tests of statistical significance) and multivariate analysis including multiple regression and Logistic Regression.

Is there a prerequisite?

No but it is assumed that students have had some type of undergraduate statistics course.

When and Where will class meet?

This is a web-based course so all of the work is done online. The class is composed of 14 **MODULES** or units. Each module has a homework assignment and a **MODULE TEST.** Homework assignments are completed at home. Module Tests are also taken at home on Blackboard. Two of the Modules require that the homework be submitted for grading in lieu of a blackboard quiz.

Is there a Text?

No!!. Everything has been put on **Blackboard**.

What Materials do I Need?

1) First, and most important, you need a good **hand calculator**.   It is recommended that you use a TI83, TI83+ or a TI84.The only real difference in these is that the newer versions use a slightly faster processor, but otherwise they are the same. These are the same calculators required in Math 116. Prices range from $90 to $140 new. **DO NOT** purchase a TI85 or TI89—they do not have built in stat functions and are much more difficult to use.
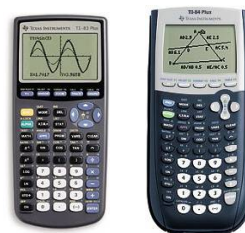
   If you don't have one of these already, you have a couple of options. Used TI83 calculators are available at one of the off-campus bookstores for about $50.

2) A computer and internet connection to allow access to ***Blackboard.***

What is on Blackboard?
- ***EVERYTHING!!***
- Module Powerpoints
- Module Lectures (in the form of video files)
- Module Homework Exercises
- Module Homework solutions (also video files)
- Module Tests
- What Do You Remember? Test

MODULE TOPICS

	TOPIC
Module 1	Level of Measurement
Module 2	Basic Calculations and Central Tendency
Module 3	Measures of Dispersion
Module 4	The Normal Curve
Module 5	Bivariate Regression
Module 6	Bivariate Correlation
Module 7	Bivariate Tables
Module 8	Chi-Square, Gamma and Phi
Module 9	Sampling Distributions and One-Sample Difference of Means Test
Module 10	Two-Sample Tests
Module 11	Matched Sample T-Test and Confidence Intervals
Module 12	One-Way ANOVA
Module 13	Partial Correlation and Multiple Regression (A Grade Option Only)
Module 14	Logistic Regression (A Grade Option Only)

What are the Class Video Recordings on Blackboard?

Lectures and homework solutions for the course have been recorded as video files under the **TEGRITY** component of Blackboard. These are in video files that you can play on your computer. You can also save them to be played more than once. They can also be saved as video or audio files to be played on other devices such as IPODS.

Are There Any Additional Materials or Readings?

Yes. Supplemental reading materials are also available in pdf format for each module to help students. This is not required reading, but is offered as a supplement to the video lectures. Please contact the Department of Sociology Office Associate Vicki.armstrong@wku.edu and a copy will be mailed to you.

What if I have a *SLOW* Internet connection or a *SLOW* computer?

The lecture and homework video files require high speed internet connection since the video files are very large. If your internet connection is slow, ***the video files are also available on DVD.*** Please contact the Department of Sociology Office Associate Vicki.armstrong@wku.edu to request a copy of the materials. However, Blackboard quizzes MUST be taken online.

What about Homework?

Each Module has a homework exercise and students are expected to have completed homework assignments on their own. The homework is to prepare you for the Module Test. All of the homework problems can be printed from Blackboard. There is a separate video file that reviews the solutions to each homework assignment.

How *FAST* can I do the Modules?

You can work as fast as you want. This course is self-pace *so get moving!*   WKU On Demand classes must be completed in a 9 month period. However, students paying for the course with financial aid must finish in the semester they start the course. Please check with the Office of WKU On Demand for the rules that apply to you.

Where do I take Module Tests?

At home. There are tests for Modules 1-12. Modules 13 and 14 have no Module test but instead your homework is submitted for grading (see below)

Can I take Module Tests more than Once?

YES!! Module Tests can be taken up to 4 times each. Each test is 20 questions. **YOU HAVE 35 MINUTES TO FINISH A MODULE TEST**. Each test will be drawn from a pool of questions so don't expect the same questions each time. Blackboard will ONLY record the last Module Test score so the earlier test score will be erased the moment you start a retake.

What Happens if I Go Over the 35 Minute Limit?

Blackboard will put a ! in the grade book showing a rule violation. If it is a couple of seconds, I will accept the grade. But, anything else and I will delete the attempt and you will have to retake the test.

Can I skip some Modules?

YES! and *YES!*

First, each student can "contract" to earn either an A or a B. The number of Modules needed and the work is a little different (see below).

Second, If you have had an undergraduate statistics course you can skip the first 4 Modules provided you get at least a 75 on the *What Do You Remember? Test*. This quiz is on Blackboard and you take it at home. Here are the rules:

- You can have TWO attempts at the test.
- It is TIMED—40 minute to complete it.
- You must get at least a 75 to have "passed" the test.
- IF you pass the test, you can skip Modules 1-4 and you will be graded on a different curve.
- If you DON'T pass the test, you must complete either 12 or 14 modules.

Can I look at Modules before I take the "What Do You Remember? Test?"

Yes! Feel free to look over the material in Modules 1-4 before you take the quiz. A little review will help you pass.

Do I have to take the "What Do You Remember? Test?"

No! If you choose you can skip the test and start immediately one Module 1. It is your choice.

How are Modules 13 and 14 Different?

For the last two modules you are asked to submit your Module Homework assignment for grading in lieu of a multiple choice Blackboard test. Each homework assignment is worth 100 points, just like Module tests. Please email the assignments to me at john.faine@wku.edu and make sure they are in a Word format so that I can read them.

How Will I be Graded?

Final grades will be determined by the total number of points earned in the class. Each Module Test (Modules 1-12) is worth 100 points and the homework assignments for Module 13 and Module 14 are also worth 100 points.

To Earn an "A": Either (1) Pass the **What Do You Remember Test?** And earn a minimum of 900 points on Modules 5-14, or (2) complete Modules 1-14 with a minimum of 1260 points.

To Earn a "B": Either (1) Pass the **What Do You Remember Test?** And earn a minimum of 600 points on Modules 5-12, or (2) complete Modules 1-12 with a minimum of 900 points.

WHEN WILL FINAL GRADES BE TURNED IN?

Final grades will be submitted at 5:00 pm the last day of finals during the semester you register. Therefore, all work, including the final exam, must be completed by that date. Technically, students in WKU On Demand classes may have up to 9 months to finish the course (though failure to finish in one semester may affect financial aid). If you cannot finish in one semester first contact WKU On Demand to understand possible consequences and then contact your instructor.

WKU Policy for Students With Disabilities

Students with disabilities who require accommodations (academic adjustments and/or auxiliary aids or services) for this course must contact the Office for Student Disability Services, DUC A200l. The OFSDS telephone number is (270) 745-5004 V/TDD.
Please DO NOT request accommodations directly from the professor or instructor without a letter of accommodation from the Office for Student Disability Services.

ESSENTIAL TOOLS

These are things I really want you to master and carry away from this course:

1. Identify levels of measurement of variables
2. Interpretation of proportions, percents, rates
3. Interpretation of $\overline{X}$, ΣX_i, ΣX_i^2, $(\Sigma X_i)^2$
4. Interpretation of $\overline{X}$, median, mode,
5. Interpretation of $\Sigma (X_i - \overline{X})^2$, σ, s
6. How to find areas under normal curve
7. Interpretation of Y=a + bX.
8. How to use regression to predict
9. Interpretation of r, r^2
10. Bivariate tables: layout, terms
11. Interpretation of bivariate percentage tables: significance, strength, direction
12. Interpretation of x^2
13. Interpretation of *Gamma* and *Phi*
14. Steps/logic of hypothesis testing
15. When these tests are used:
    (1) one sample difference of mean
    (2) one sample difference of proportions
    (3) two sample difference of means
    (4) two sample difference of proportions
    (5) Matched Sample Difference of Means test
16. Confidence Intervals Around Mean and Proportions
17. Interpretation of Multiple Regression parameters
18. Interpretation of Logistic Regression parameters

Symbols Page

SYMBOLS   Name

1. X_i _____

2. Σ _____

3. $\overline{X}$ _____

4. u _____

5. ΣX_i _____

6. ΣX_i^2 _____

7. $(\Sigma X_i)^2$ _____

8. $\sum (X_i - \overline{X})^2$ _____

9. σ _____

10. σ^2 _____

11. s _____

12. s^2 _____

13. Z_i _____

14. ΣY_i _____

15. ΣY_i^2 _____

16. ΣXY_i _____

17. r _____

18. r^2 _____

19. b _____

20. a _____

21. Y_i' _____

22. $\sum (Y_i - Y_i')^2$ _____

23. x^2 _____

24. G _____

25. Φ _____

26. $\mu_{\overline{x}}$ _____

27. $\sigma_{\overline{x}}$ _____

28. p_μ _____

29. p_s _____

30. μ_p _____

31. σ_p _____

32. $\overline{D}$ _____

33. SSB _____

34. SSW _____

35. $r_{yx.z}$ _____

36. R^2 _____

FORMULAS

$p = \dfrac{f_i}{n}$ $\qquad$ $\% = \dfrac{f_i}{n}(100)$ $\qquad$ ratio$= \dfrac{f_1}{f_2}$ $\qquad$ rate$= \dfrac{f_i}{n} \times Base$ $\quad$ (e.g., 100, 1000, 100,000)

$\underline{\text{proportion}}$ $\qquad$ $\underline{\text{percent}}$ $\qquad\qquad$ $\underline{\text{ratio}}$ $\qquad\quad$ $\underline{\text{rate}}$

$\mu = \dfrac{\Sigma X_i}{n}$ $\qquad\qquad$ $\overline{X} = \dfrac{\Sigma X_i}{n}$

$\underline{\text{population mean}}$ $\qquad$ $\underline{\text{sample mean}}$

$SS = \Sigma (X_i - \mu)^2 = \Sigma (X_i - \overline{X})^2$ $\qquad$ or $\qquad$ $SS = \Sigma X_i^2 - \dfrac{(\Sigma X_i)^2}{n}$

$\underline{\text{sum of squares (theoretical)}}$ $\qquad\qquad$ $\underline{\text{sum of squares (computational)}}$

$\sigma^2 = \dfrac{SS}{n}$ $\qquad$ $\sigma = \sqrt{\dfrac{SS}{n}}$ $\qquad$ $s^2 = \dfrac{SS}{n-1}$ $\qquad$ $s = \sqrt{\dfrac{SS}{n-1}}$

$\underline{\text{population variance}}$ $\;$ $\underline{\text{population st. dev.}}$ $\quad$ $\underline{\text{sample variance}}$ $\qquad$ $\underline{\text{sample st. dev.}}$

$Z_i = \dfrac{(X_i - \mu)}{\sigma} = \dfrac{(X_i - \overline{X})}{s}$

$\underline{\text{Z-scores}}$

$b = \dfrac{n\Sigma XY - (\Sigma X_i)(\Sigma Y_i)}{n\Sigma X_i^2 - (\Sigma X_i)^2}$ $\qquad$ $a = \overline{Y} - b\overline{X}$ $\quad$ or $\quad$ $\dfrac{\Sigma Y_i}{n} - b\dfrac{\Sigma X_i}{n}$

$\qquad$ $\underline{\text{regression coefficient (slope)}}$ $\qquad\qquad$ $\underline{\text{Y-intercept}}$

$r = \dfrac{n\Sigma XY - (\Sigma X_i)(\Sigma Y_i)}{\sqrt{\left[n\Sigma X_i^2 - (\Sigma X_i)^2 \right]\left[n\Sigma Y_i^2 - (\Sigma Y_i)^2 \right]}}$

$$r = \frac{n\Sigma XY - \left(\Sigma X_i\right)\left(\Sigma Y_i\right)}{n\sqrt{[SS_X][SS_Y]}}$$

Pearson's r   (correlation coefficient)

$$\chi^2 = \sum_{all}^{cells} \frac{(f_o - f_e)^2}{f_e} = \left[\sum \frac{f_o^2}{f_e}\right] - n \qquad d.f. = (r-1)(c-1)$$

Chi-Square

$$Gamma = \frac{Ns - Nd}{Ns + Nd}$$

$$Z = \frac{\overline{X} - \mu}{\sigma_{\overline{X}}} = \frac{\overline{X} - \mu}{\sigma/\sqrt{n}} \qquad\qquad t = \frac{\overline{X} - \mu}{s/\sqrt{n}} \qquad d.f. = (n-1)$$

One Sample Difference of Means Test

$$Z = \frac{\left(Ps - P\mu\right)}{\sqrt{\left[\frac{\left(Pu\right)\left(1 - P\mu\right)}{n}\right]}}$$

One Sample Difference of Proportions test

$$C.I. = \overline{X} \pm Z(\sigma/\sqrt{n}) \quad = \overline{X} \pm t(s/\sqrt{n}) \quad (d.f. = n-1)$$

Confidence Interval Around Mean

$$C.I. = p_s \pm Z\sqrt{\frac{(P_u)(1 - p_u)}{n}}$$

Confidence Interval Around Proportion

$$Z = \frac{\overline{X}_1 - \overline{X}_2}{\sigma_{\overline{x} - \overline{x}}} = \qquad where \quad \sigma_{\overline{x} - \overline{x}} = \sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}$$

Two-sample Difference of Means (σ^2 known)

$$t = \frac{\overline{X}_1 - \overline{X}_2}{s_{\overline{x} - \overline{x}}} \qquad where \quad s_{\overline{x} - \overline{x}} = \sqrt{\frac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{n_1 + n_2 - 2}} \sqrt{\frac{1}{n_1} + \frac{1}{n_2}} \qquad d.f. = (n_1 + n_2 - 2)$$

Two sample Difference of Means (σ^2 Unknown)

$$Z = \frac{P_{s_1} - P_{s_2}}{\sigma_{p-p}} \qquad where \quad \sigma_{p-p} = \sqrt{P_\mu (1 - P_\mu)} \sqrt{\frac{1}{n_1} + \frac{1}{n_2}} \quad and$$

$$P\mu = \frac{X_1 + X_2}{n_1 + n_2} \quad or \quad \frac{n_1 P_{s_1} + n_2 P_{s_2}}{n_1 + n_2}$$

Two Sample Difference of Proportions

$$r_{YX.Z} = \frac{r_{YX} - (r_{YZ})(r_{XZ})}{\sqrt{(1 - r_{YZ}^2)(1 - r_{XZ}^2)}}$$

Partial Correlation Coefficient