

## Course Syllabus:

### Psychology 520T -- Factor Analysis

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#### Course Description/Objectives:

The goal of this course is to develop skills in a range of procedures for exploratory and confirmatory factor analysis. The focus will be on practical issues such as preparing data for analysis, selecting the appropriate analysis, menu-driven and syntax programming, interpreting output, and presenting results of a complex nature. Both SPSS and EQS will be used, along with AMOS Graph. Topics to be covered include data screening, factor and principal components analysis, selection of factors, rotation, and confirmatory techniques. Comparisons to MDS and Cluster analysis will also be made.

The main learning goals of this course are to (a) expose the student to advanced statistical techniques, (b) make the student proficient in the techniques, (c) give the student the expertise to “think” about appropriate statistical techniques for the designs they will face in academic and applied settings, and (d) give the student exposure to different analytic strategies and philosophies.

Prerequisite for the course is being in our Graduate program (or graduate program in a related discipline) AND Psyc 465 or equivalent, or my permission. In addition, the course is writing and computer intensive (using SPSS, EQS, and AMOS Graph).

#### Required materials:

- Any version of SPSS
- EQS
- AMOS Graph

#### Required reading:

Byrne, B. B. (2006). *Structural equation modeling with EQS: Basic concepts, applications, and programming* (2<sup>nd</sup> ed.). NY: Psychology Press.

Gorsuch, R. (1983). *Factor analysis* (2nd Ed.). NJ: Erlbaum

[there will also be additional readings which are proved via PDF]

Lecture Schedule and Assigned Reading (PDFs on [www.dukeresearch.org](http://www.dukeresearch.org))

Week 1 Readings:

-- Introduction to Exploratory Factor Analysis

Chapter 1 - Gorsuch

1A - Vincent, D.F. (1953). The origin and development of factor analysis. *Applied Statistics*, 2, 107-117.

2A - Costello, A. B., & Osborne, J. W. (2005). Best practices in exploratory factor analysis: Four recommendations for getting the most from your analysis. *Practical Assessment, Research, and Evaluation*, 10. Available online: <http://pareonline.net/getvn.asp?v=10&n=7>

3A - Russell, D. W. (2002). In search of underlying dimensions: The use (and abuse) of factor analysis in *Personality and Social Psychology Bulletin*. *Personality and Social Psychology Bulletin*, 28, 1629-1646.

4A - Fabrigar, L. R., Wegener, D. T., MacCallum, R. C., & Strahan, E. J. (1999). Evaluating the use of exploratory factor analysis in psychological research. *Psychological Methods*, 4, 272-299.

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Week 2 Readings:

-- Introduction (Cont.)

Chapter 2, 3 - Gorsuch

click on link for PDF - Marelich, W.D., & Clark, T. (2004). HIV testing and false disclosures in heterosexual college students. *Journal of American College Health*, 53, 109-115.

5a) Floyd, F. J., & Widaman, K. F. (1995). Factor analysis in the development and refinement of clinical assessment instruments. *Psychological Assessment*, 7, 286-299.

6a) Gorsuch, R. L. (1997). Exploratory factor analysis: Its role in item analysis. *Journal of Personality Assessment*, 68, 532-560.

7a) Reis, S. P., Waller, N. G., & Comrey, A. L. (2000). Factor analysis and scale revision. *Psychological Assessment*, 12, 287-297.

8a) Thompson, B., & Daniel, L.G. (1996). Factor analytic evidence for the construct validity of scores: A historical overview and some guidelines. *Educational and Psychological Measurement*, 56, 197-208.

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Week 3 Readings:

-- Assumptions and Data/Sample Size Issues

Gorsuch Chapters 4,5,6

9b) Tabachnick, B. G., & Fidell, L. S. (2001). *Using multivariate statistics* (4th ed., pp. 588-590). Boston: Allyn and Bacon.

10b) MacCallum, R. C., & Widaman, K. F. (1999). Sample size in factor analysis. *Psychological Methods*, 4, 84-99.

11b) Atkinson, L. (1988). The measurement-statistics controversy: Factor analysis and subinterval data. *Bulletin of the Psychonomic Society*, 26, 361-364.

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Week 4 Readings:

-- On factor Solutions and Rotation Fit

Gorsuch Chapters 8,9,10

12b) Cliff, N. (1988). The eigenvalues-greater-than-one rule and the reliability of components. *Psychological Bulletin*, 103, 276-279.

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Week 5 Readings:

-- On Parallel Analysis, etc.

13b) Horn, J.L. (1965). A rationale and test for the number of factors in factor analysis. *Psychometrika*, 30, 179-185.

14b) Lautenschlager, G.L. (1989). A comparison of alternatives to conducting Monte Carlo analyses for determining parallel analysis criteria. *Multivariate Behavioral Research*, 24, 365-395.

15b) O'Connor, B.P. (2000). SPSS and SAS programs for determining the number of components using parallel analysis and Velicer's MAP test. *Behavior Research Methods, Instruments, and Computers*, 32, 396-402.

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Week 6 Readings:

--- PCA issue with highly correlated items

16b) Ramsey, F.L. (1986). A fable of PCA. *The American Statistician*, 40, 323-324.

---- Introduction to SEM and CFA

17c) Lei, P., & Wu, Q. (2007). Introduction to structural equation modeling: Issues and practical considerations. *Educational Measurement, Issues and Practice*, 26, 33-43.

Byrne -- Part 1, Part 2 (Application 1 and 2)

Introduction to AMOS Graph

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Week 7 Readings:

---- On fit and reporting of SEM and CFA

18c) Marsh, H. W., & Balla, J. (1994). Goodness of fit in confirmatory factor analysis: The effects of sample size and model parsimony. *Quality and Quantity*, 28, 185-217.

19c) McDonald, R. P., & Ho, M. R. (2002). Principles and practice in reporting structural equation analyses. *Psychological Methods*, 7, 64-82.

20c) Marsh, H. W., Hau, K., & Wen, Z. (2004). In search of golden rules: Comment on hypothesis-testing approaches to setting cutoff values for fit indexes and dangers of overgeneralizing Hu and Bentler's (1999) findings. *Structural Equation Modeling*, 11, 320-341.

21c) Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structural analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling*, 6, 1-55.

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#### Week 8 Readings:

--CFA Continued

22d) Anderson, J.C., & Gerbing, D.W. (1988). Structural equation modeling in practice: A review and recommended two-step approach. *Psychological Bulletin*, 103, 411-423.

23d) Prooijen, J., & Kloot, W.A. (2001). Confirmatory analysis of exploratively obtained factor structures. *Educational and Psychological Measurement*, 61, 777-792.

24d) Gerbing, D.W., & Hamilton, J.F. (1996). Viability of exploratory factor analysis as a precursor to confirmatory factor analysis. *Structural Equation Modeling*, 3, 62-72.

--CFA and 2nd-Order FA

25) Marelich, W.D., Lundquist, J., Painter, K., & Mechanic, M.B. (2008). Sexual deception as a social-exchange process: Development of a behavior-based sexual deception scale. *The Journal of Sex Research*, 45, 27-35.

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#### Week 9 Readings:

--CFA and 2nd-Order FA Continued

26) Murphy, D.A., Marelich, W.D., & Hoffman, D. (2000). Assessment of anxiety and depression in young children: Support for two separate constructs. *Journal of Clinical Child Psychology*, 29, 383-391.

27e) Rindskopf, D., & Rose, T. (1988). Some theory and applications of confirmatory second-order factor analysis. *Multivariate Behavioral Research*, 23, 51-67.

-Byrne -- Chapter 5

-Gorsuch -- Chapter 11

-EQS Program Manual

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#### Week 10 Readings:

--CFA and Multi-group Analyses

-Byrne -- Chapter 7 (all - the way we do it now)

-Gorsuch --Chapter 5 (old school approach)

28) Murphy, D. A., Rotheram-Borus, M.J., & Marelich, W.D. (2003). Factor structure of a coping scale across two samples. *Journal of Applied Social Psychology*, 33, 627-647.

29e) Werts, C. E., Rock, D. A., Linn, R. L., & Joreskog, K. G. (1976). Comparison of correlations, variances, covariances, and regression weights with or without measurement error. *Psychological Bulletin*, 83(6), 1007-1013. doi:10.1037/0033-2909.83.6.1007

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#### Week 11 Readings:

-CFA and missing data, bootstrap

-Bentler (EQS program manual) -- Chapters 12-13

30) [applied example for a covariance structural model] Murphy, D.A., Marelich, W.D., & Amaro, H. (2009). Maternal HIV/AIDS and adolescent depression: A covariance structure analysis of the 'Parents and Adolescents Coping Together' (PACT) model. *Vulnerable Children and Youth Studies*, 4, 67-82. doi:10.1016/j.jadohealth.2011.12.025

-Factor analysis and Cluster/MDS analyses

31f) Liau, A., Tan, T., & Khoo, A. (2011). Scale measurement: Comparing factor analysis and variable clustering. *SAS Global Forum*, Paper 352-2011.

32f) Tucker-Drob, E. M., & Salthouse, T. A. (2009). Confirmatory factor analysis and multidimensional scaling for construct validation of cognitive abilities. *International Journal of Behavioral Development*, 33, 277-285.

33) Gorsuch, Chapter 9 (end of chapter), Chapter 12

-Close-out of Factor Analysis, pros/cons

34) Gorsuch, Chapters 17-18

#### Week 12-13 Readings/Sched

Independent work on project/presentation, meetings with Professor

#### Week 14-16 Readings/Sched

Student Presentations

[The above schedule should be viewed as tentative.]

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### Additional Lecture Material

- Bryant, F.B., & Yarnold, P.R. (2000). Principal components analysis and exploratory and confirmatory factor analysis. In L.G. Grimm & P.R. Yarnold (Eds.), *Reading and understanding multivariate statistics* (pp. 99-136). APA.
- Duntemen, G.H. (1989). *Principal components analysis (#69)*. Newbury Park, CA: Sage.
- Gorsuch, R.L. (1997). New procedure for extension analysis in exploratory factor analysis. *Educational and Psychological Measurement*, 57, 725-740.
- Marcoulides, G, & Hershberger (1997). *Multivariate statistical methods: A first course*. Erlbaum.
- Nie, N.H., Hull, C.H., Jenkins, J.G., Steinbrenner, K., & Bent, D.H. (1975). *SPSS: Statistical package for the social sciences* (2nd ed.). NY: McGraw-Hill.
- Stevens, J. (2001). *Applied multivariate statistics for the social sciences* (4th ed.). Erlbaum.
- Tabachnick & Fidell (2001). *Using multivariate statistics* (4th ed.). Allyn & Bacon.
- Thompson, B. (1994). Guidelines for authors. *Educational and Psychological Measurement*, 54, 837-847.
- Ullman, J.B. (2001). Structural equation modeling. In Tabachnick & Fidell (Eds.), *Using multivariate statistics* (4<sup>th</sup> ed) (pp. 653-771). Allyn & Bacon.

Assignments (Portfolios):

Portfolio assignments will be made every few weeks or weekly. Grading will be on an 11-point scale. Late assignments will be penalized. Accompanying the computer output for each portfolio should be a brief 5-10 page summary, including interpretation of findings written in APA results section style. The output should be annotated. After Portfolios are assigned, they will be due 1-week later or TBD. If the portfolio is subpar, you may be asked to redo the portfolio -- maximum score on a redone portfolio will be 7.75. If asked to redo, you have 1-week to revise the assignment.

Group Project & Presentation:

Students can work in pairs and select a topic covered in class and prepare an individual project. Students will work with the instructor to select an appropriate statistical technique, develop the class presentation, and produce a written summary of the project. Clarity and accuracy are crucial. A written summary of the project is due the last day of class. The project paper should be about 20 pages long, written in APA format with output appended and annotated. The project will be assessed for clarity, depth, effort, demonstration of understanding, and accuracy.

Class Participation:

This reflects your mindfulness as a student and is an easy 5% unless you do one of the following: 1) always come late, 2) always leave early, 3) are disruptive/inappropriate to other students or me during lecture, 4) text during lecture or other smartphone use or utilize other social media, 5) consistently are absent and I notice it w/o excuse.

Grading:

The course will be based on:

45% -Assignment Portfolios; 20%-Presentation of topic; 30%-Written summary of topic; 5%-Class Part.

Grading Procedure:

I will use the typical A,B,C approach (no +/-).

|           |     |
|-----------|-----|
| 90-100%   | = A |
| 80-89%    | = B |
| 70-79%    | = C |
| 60-69%    | = D |
| Below 60% | = F |

Extra Credit

None

Special Needs

If you need special assistance, please inform the instructor in order to facilitate contact with the office of Disability Support Services located at UH-101. You can reach the office by phone (657-278-3117) or at the web site below.

<http://www.fullerton.edu/disabledservices>

Below is University/Dept. boilerplate

Academic Integrity:

Students who violate university standards of academic integrity are subject to disciplinary sanctions, including failure in the course and suspension from the university. Since dishonesty in any form harms the individual, other students and the university, policies on academic integrity are strictly enforced. It is expected that you will familiarize yourself with the academic integrity guidelines found in the current student handbook and in the following University Policy Statement:

*University Policy Statement on Cheating*

*“Plagiarism is defined as the act of taking the work of another and offering it as one’s own without giving credit to that source. When sources are used in a paper, acknowledgment of the original author or source must be made through appropriate references, and, if directly quoted, quotation marks or indentations must be used.” (UPS 300.021, “Academic Dishonesty”),*

[http://www.fullerton.edu/senate/publications\\_policies\\_resolutions/ups/UPS%20300/UPS%20300.021.pdf](http://www.fullerton.edu/senate/publications_policies_resolutions/ups/UPS%20300/UPS%20300.021.pdf)

Academic integrity violations include behaviors such as plagiarism (e.g., using another’s words or sentence structure as your own), working with others when participating in discussion forums, and consulting others and/or course materials during the exam. If you have questions regarding what constitutes cheating or how to avoid it, please contact the professor and consult your student handbook.

Sanctions for Violation of Academic Integrity

If, based on the evidence and consultation with you on the matter, I conclude that you are responsible for a case of academic dishonesty, I will apply an appropriate academic sanction (subject to student appeal) in accordance with UPS 300.021, “including, but not limited to: oral reprimand; ‘F’ or ‘0’ on the assignment; grade reduction on assignment or course; or “F” in the course.”

A report will also be made to the Psychology Department Chair and Dean of Students Office, Student Conduct. After investigation and due process procedures, there could be sanctions that “include but are not limited to: warning, probation, educational sanctions, removal from academic program, suspension, expulsion, denial of admission or enrollment in university classes including Extended Education.”

Attendance Policy:

You are required to attend all class sessions unless a proper excuse is provided.



### **Student Responsibilities and Lecture/Course Topics Disclaimer**

- 1) Portfolios are due when they are due – redos will be given a strict date to turn-in again.
- 2) Email: You must check your University email at least ONCE a day during the week (Monday thru Friday) for any updated assignments or class information.
- 3) Lecture examples (including online comments) may contain material that you may deem offensive, philosophically disagree with, or that may be striking in terms of subjective content. Uncomfortable topics may include: conducting intervention studies on real populations such as those infected or affected by HIV/AIDS or other STDs, the spread of such diseases, risky-behaviors, and illegal drug use or alcohol consumption. This may be in the form of office or classroom, films, music, or other audio/visual material. This material is not intended to offend anyone. The "offensive" or "controversial" material/ideas expressed in the material presented do not necessarily reflect the views of the instructor, the Department of Psychology, or CSU Fullerton. Nonetheless, because these materials speak to issues relevant in psychology, they are essential. By continuing with this course you are agreeing to be held academically accountable for all required material in this course, regardless of the "offensive" or "controversial" nature.
- 4) All lecture materials noted in class (including online comments) are backed by peer-reviewed published research and/or from textbooks (unless noted). In addition, as a well-published and active researcher in the field of Applied Social Psychology and related areas (e.g., health psychology, research on close relationships and sexuality), and in Applied Quantitative Methods, it is my right to present my on-going research and share my thoughts on research-related issues.
- 5) Though you may disagree with some conclusions presented in the class, please note that the material presented is science, at least one truth as part of science and the scientific method. There are of course multiple truths in science, and there are other courses in College that may present alternative truths. Be open to new things, and be open to multiple truths.
- 6) If you have any issues with the above, feel free to contact me at [wmarelich@fullerton.edu](mailto:wmarelich@fullerton.edu) or (657) 278-7374. You may also contact Student Affairs at [StudentAffairs@fullerton.edu](mailto:StudentAffairs@fullerton.edu) or (657) 278-3221 or Human Resources, Diversity & Inclusion at [mosorio@fullerton.edu](mailto:mosorio@fullerton.edu) or (657) 278-7169 or [mtapper@fullerton.edu](mailto:mtapper@fullerton.edu) or (657) 278-4207.

## DEPARTMENT OF PSYCHOLOGY

### Student Responsibility Code

The Department of Psychology is dedicated to providing you with the highest quality educational program. In order to maximize the benefits of our program, it is important that you meet your responsibilities as a student. Listed below are some of the responsibilities to be met.

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**Advisement** – Please familiarize yourself with university and departmental policies and deadlines.

You should obtain and read pertinent sections of the University Catalog and instructor course outlines. If you are a psychology major or minor, you should read the Psychology Student Handbook and meet with a psychology undergraduate advisor (Room H-830J) at least once a year to review your study plan and career goals. The Handbook is available at <http://psychology.fullerton.edu/advisement/> (scroll down to the bottom to see the link).

**Class Attendance** – Please remember that you are responsible for attending all classes and laboratory meetings, and for being on time. The benefit you derive from your education is often lost if you are lost too!

**The Learning Environment** – Please be mindful of your fellow students and the instructors.

Behavior that persistently interferes with classroom activities may be subject to disciplinary action. Such behavior may include, but is not limited to, cell phones ringing, entering the class late, leaving the class prematurely, eating in class or chatting with other students during class. A student responsible for continual disruptive behavior may be required to leave class pending discussion and resolution of the problem.

**Workload** – Please be realistic in adjusting your outside responsibilities (work, family, social obligations, etc.) in order to allow sufficient time for your education.

In order to receive a quality education, you must not overload yourself. As a general rule, you should allow two to three hours of study outside of class, for each hour spent in class. Additional information on this topic is discussed in the Psychology Student Handbook.

**Academic Integrity** – The world of academia is completely dependent on straightforward honesty and integrity, and it protects these values in many ways. Your ability to think of yourself as an educated person depends on these same values. For these reasons the University imposes serious penalties for breaches of academic honesty and cases of suspected breaches of honesty may be reported. Please familiarize yourself with the academic integrity guidelines found in the current student handbook and the CSUF Student Conduct site <http://www.fullerton.edu/integrity/student/AcademicIntegrityResources.asp>.

1. Work produced through academic misconduct (e.g., cheating on exams, plagiarism) will be dealt with according to the policies of the academic integrity guidelines. Students who violate university standards of academic integrity are subject to disciplinary sanctions, including failure in the course and suspension from the university. Since dishonesty in any form harms the individual, other students and the University, policies on academic integrity are of great concern to us all.
2. Your exams, homework, research reports, and term papers should reflect your own work, unless your instructor directs you otherwise.
3. Proper methods of referencing outside sources of information should be used at all times. Additional information on this requirement may be obtained by reading the University Catalog section on Academic Dishonesty.

**Special Needs** – If you need special assistance in the classroom, please apply for services from the office of Disability Support Services (UH-101, 657-278-3112, <http://www.fullerton.edu/dss/>) and notify the instructor by the end of the first week of the semester.

**Emergency Procedures** – In the event of an emergency, please adhere to these university guidelines. <http://prepare.fullerton.edu/campuspreparedness/ClassroomPreparedness.php>

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*If you have any questions concerning the above responsibilities, please contact your psychology instructor or the Psychology Department Chair.*

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