

APPLIED QUANTITATIVE REASONING I -- SYLLABUS

COURSE OBJECTIVES

Decision making for planning, policy, and management relies increasingly on **quantitative reasoning**, which entails the collection, analysis and interpretation of *quantitative* data. "Applied Quantitative Research I" provides some key tools for **quantitative reasoning**. This course is designed to introduce students to quantitative principles and techniques that can support decision making, and to their application in planning and public administration.

The course presents the logic of quantitative analysis; it introduces basic techniques for data description and presentation to lay audiences, using computer technology, including spreadsheets, and analysis, modeling, and presentation software; and, it expands the student's ability to reason quantitatively in the context of planning and public administration. Students will learn to:

- identify types of problems that lend themselves to quantitative analysis; ask questions that can be answered through quantitative reasoning; formulate hypotheses to be explored quantitatively;
- identify the means to test the hypotheses (logic, procedure, data);
- carry out analyses, understand the meaning of results and reapply results to the initial or similar problems;
- use statistical, computational and spatial software
- present the results to specified audiences;
- evaluate results of research carried out and reported by others;
- apply the new knowledge to decision making.

COURSE METHOD

The course consists of:

- lectures on quantitative methods and procedures for data description, analysis and presentation;
 - class discussions of homework solutions;
 - group exercises;
 - computer lab work using SPSS, MATHCAD and ArcGIS.
- ⇒ Students are expected to: attend all classes; participate actively in discussions and group exercises, asking clarifying questions; use the computer (as frequently as possible) for solving homework sets and (always) for text editing.
- ⇒ Homework sets and project outputs should be handed in **ON TIME** (using wordprocessing where possible.) Since homework serves the goal of sharpening communication skills that complement the analytic ones, pay attention to completeness, clarity and aspect. Grading is based on soundness of the analytical thinking, effectiveness of interpretation, and communication of results.
- ⇒ Prepare for class sessions by reading text assignments and identifying topics that need clarification in class. Feel free to raise questions (even if you suspect you are the only one who does not know the answer) to ensure that you thoroughly understand and are able to apply discussed procedures in contexts outside the classroom.

COURSE PREREQUISITE

Students should have passed the assessment test or taken UST501.

Visit the syllabus on the WEB: go to
<http://urban.csuohio.edu/~sanda/syl/stat.htm>
Check the Quantitative Methods page too:
<http://urban.csuohio.edu/~sanda/syl/qm/>

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Connect to the course WEB page for up-to-date links to web simulations and to other related sites, and for SPSS and SPSS exercises.

TEXTS

- Kachigan S. (1982). **Statistical Analysis**. New York: Radius Press.
- Cronk B.C. (2002). **How to use SPSS: A step-by-step guide to analysis and interpretation**. Second edition. Pyrczak Publishing (optional).

On the WEB:

- Trochim, W. (1997). **The Knowledge Base, An Online Research Methods Textbook**, www.socialresearchmethods.net
- **Exploring Data**, Education Queensland: <http://exploringdata.cqu.edu.au/>
- David Lane, **HyperStat Online**, <http://davidmlane.com/hyperstat/index.html>
- Web-based SPSS tutorials, <http://urban.csuohio.edu/~sanda/syl/601/601read.htm>

ADDITIONAL READINGS¹

- Andranovich G., Riposa G., 1993. **Doing Urban Research**. Sage.
- Babbie, E & Halley, F., Zaino J. (2003). **Adventures in Social Research: Data Analysis Using SPSS 11.0 for Windows**, Pine Forge Press
- Bingham R. D., Ethridge M. eds. (1982). **Reaching Decisions in Public Policy and Administration**. Longman.
- Clemen R. T. (1991). **Making Hard Decisions: An Introduction to Decision Analysis**. Boston: PWS Kent Publishing Company.
- Clogg C., Shihadeh E., 1994. **Statistical models for ordinal variables**, Sage.
- Creswell J., 1994. **Research Design: qualitative and quantitative approaches**. Sage.
- Finsterbusch K., Bender Motz A. (1980). **Social Research for Policy Decisions**. Belmont: Wadsworth.
- Freedman D., Pisani R., and Purves R. (1991), **Statistics**, 2nd edition, W.W. Norton and Company
- Goldenberg S. (1992). **Thinking Methodologically**. Harper Collins Publishers.
- Gonick L. and Smith W. (1993), **The Cartoon Guide to Statistics**, Harper Perennial, New York
- Hoover K. R. (1992). **The Elements of Social Scientific Thinking**. NY: St. Martin.
- Inbar M. (1979). **Routine Decision Making: The Future of Bureaucracy**. Sage.
- Knoke, David & George W. Bohrnstedt, 1994. **Statistics for Social Data Analysis**. Itasca, Illinois: F. E. Peacock Publishers, Inc.
- Kanji G. (1993). **100 statistical tests**. Sage.
- Lapin L. L. (1991). **Quantitative Methods for Business Decisions**. New York: Harcourt Brace Jovanovich Publishers.
- Matlack W. F. (1994). **Statistics for Public Managers**. F. E. Peacock Publishers, Inc.
- Meier K. J., Brudney J. L. (1993). **Applied Statistics for Public Administration, 3d Edition**. Belmont: Wadsworth Publishing Company.
- Mendenhall W., Beaver R. (1994), **Introduction to Probability and Statistics**, 9th edition, Duxbury Press, Belmont
- Mendenhall W., Sincich T. (1993), **A Second Course in Business Statistics: Regression Analysis**, 4th edition, Macmillan, New York, NY
- Moore D., McCabe G. (1993), **Introduction to the Practice of Statistics**, 2nd edition, W.H. Freeman & Co.
- Moore, David, George McCabe, William Duckworth & Stanley Sclove, 2003. **The Practice of Business Statistics: Using Data for Decisions**. Freeman.
- Nachmias D. (1980). **The Practice of Policy Evaluation**. New York: St. Martin's Press.
- Raiffa H. (1970). **Decision Analysis: Introductory Lectures on Choices under Uncertainty**. Reading: Addison-Wesley.
- Rea L., Parker R. (1992). **Designing and conducting survey research: A comprehensive guide**. San Francisco: Jossey-Bass.

¹ For course-related, interactive WEB sites, visit the syllabus on the WEB.

- Sirkin R. Mark (1995). *Statistics for the Social Sciences*. Sage.
- Smith Herman W. (1991). *Strategies of Social Research*. Holt, Rinehart and Winston.
- Triola, M. (1997) *Elementary Statistics*. Addison-Wesley.
- Vogt W. P. (1993). *Dictionary of statistics and methodology, a nontechnical guide for the social sciences*. Sage.
- Wonnacott, TH & Wonnacott, RJ (1990). *Introductory Statistics*, 5th edition , Wiley.

PROGRAM EVALUATION

- Hill, Morris, 1968. A Goals-Achievement Matrix for Evaluating Alternative Plans, *Journal of the American Institute of Planners*, Vol. XXXIV, Number 1 (January)
- Edwards, W., and J. Newman, 1982. *Multiattribute Evaluation*, Quantitative Applications in the Social Sciences Series, Sage, Newbury Park.
- Munda, G., P. Nijkamp, and P. Rietveld, 1994. Qualitative Multicriteria Evaluation for Environmental Management, *Ecological Economics*, 10: 97-112.
- Nijkamp, P., P. Rietveld, and H. Voogd, 1990. *Multicriteria Evaluation in Physical Planning*, Amsterdam, from Elsevier Science.
- Ortolano, L., 1984. *Environmental Planning and Decision Making* , Wiley & Sons, New York. (Ch.8)
- Voogd, H., 1983. *Multicriteria Evaluation for Urban and Regional Planning*, London, Pion Limited.

EVALUATION PROCEDURE

The final grade will be a composite of:

Grades for	Weight
Periodic assignments (expected every T)	10%
Class participation (class time group exercises)	10%
Computer labs (UR40) (MathCAD, if offered)	15%
Midterm 1 (2/25, class time)	20%
Midterm 2 (3/28, class time)	20%
Final (5/9, class time)	25%

- * No extra credit beyond the list above.
- * Late homeworks will **not** be accepted since solutions are discussed in class.
- * The (open book) midterms and final will test accumulated knowledge and ability to respond to new problems. While focusing on the most recent lecture topics, exams have to rely on concepts covered earlier; in preparation, review earlier material and avoid falling behind in readings or homeworks.
- * Attendance at **all** exams is **required**. Makeups will be given only in emergency cases (proof required; vacation arrangements are not emergencies) and with advance notice. The student must schedule the make-up exam within 7 days of the in-class exam. The make-up exam will vary in form, content, and length from that given in class. Except in these rare circumstances, students earn a score of zero on missed exams (and all three are needed to pass the class).

OFFICE HOURS, LOCATION, PHONE

Office: UR220.
Office hours: Before class and by appointment.
Office phone: 216.687.2367
E-Mail: s.kaufman@csuohio.edu
Computer Lab hours: Consult the LCUA WEB page

IMPORTANT CSU DATES

See CSU Academic calendar, <http://www.csuohio.edu/registrar/calendar/>

UNIVERSITY POLICIES

PLAGIARISM (<http://www.csuohio.edu/writingcenter/Plagiarism.html>)

- CSU Student Handbook definition:

Plagiarism – Stealing and/or using the ideas or writings of another in a paper or report and claiming them as your own. This includes but is not limited to the use, by paraphrase or direct quotation, of the work of another person without full and clear acknowledgment.

(Academic Regulations <http://www.csuohio.edu/studentlife/conduct/acadregs.html>)

- Penalties for plagiarism
The penalties for plagiarism are found in full in the Student Handbook under Academic Conduct Regulations (Policy on Academic Misconduct) at the following link:
<http://www.csuohio.edu/studentlife/conduct/acadregs.html>

OTHER

- Refer to the CSU Bulletin for add/drop/withdrawal procedures, S/U and incomplete grading.
- For class cancellations due to weather, call CSU information (687-2000) before class.
- Grades cannot be changed after their issuance at the end of the Semester.

STUDENTS WITH SPECIAL NEEDS

“Educational access is the provision of classroom accommodations, auxiliary aids and services to ensure equal education opportunities for all students regardless of their disability.

Any student who feels he or she may need an accommodation based on the impact of disability should contact the Office of Disability Services at 216.687.2015. The Office is located in UC304. Accommodations need to be requested in advance and will not be granted retroactively.”

Students should notify the instructor as soon as possible if they have been granted an accommodation through the Office of Disability Services.

SCHEDULE

TENTATIVE (CHANGES ARE EXPECTED AND WILL BE ANNOUNCED IN CLASS AND ON THE WEB)

WEEK	READ	SUBJECT	COMPUTER LAB
1. 1.14	Chapters 1, 2	Introduction —class organization, course content <i>The nature of quantitative reasoning and its use in decisions. The nature of statistical analysis. Objects, Variables and Scales</i>	
2. 1.21		MARTIN LUTHER KING DAY, NO CLASS	
3. 1.28	Chapters 3, 4	Data Reduction: Frequency distributions <i>Central tendency</i>	
4. 2.4	Chapter 5	Data Reduction: Variation	MathCAD 1 – Introduction
5. 2.11	Chapters 6, 7	Probability basics Inference: Sampling distributions	
6. 2.18		PRESIDENTS' DAY (NO CLASS)	
7. 2.25	<i>Chapters 1-5</i>	MIDTERM 1 (class time, open book)	
8. 3.3	Chapter 8	Inference: Parameter estimation	MathCAD 2 - probabilities
9. 3.10		SPRING BREAK	
10. 3.17	Chapter 9	Inference: Hypothesis testing	MathCAD 3: sample means
11. 3.24	<i>Chapters 7-10</i>	MIDTERM 2 (class time, open book)	
12. 3.31	Chapter 10	Identification of association: Correlation analysis	
13. 4.7	Chapter 11	Identification of association: Regression analysis	MathCAD 4: regression
14. 4.14	Chapter 11 (cont.)	Identification of association: Regression analysis	
15. 4.21	Chapter 13	Identification of association: Categorical Data	
16. 4.28	<i>Chapter 21</i>	Decision Analysis	
17. 5.5	<i>Chapters 11-13, 21</i>	FINAL EXAM (class time, open book)	

GO TO THE WEB:

- ☑ <http://urban.csuohio.edu/~sanda/syl/stat.htm> for the location of the SPSS data sets;
- ☑ http://www.cas.lancs.ac.uk/glossary_v1.1/basicdef.html Statistics Glossary for basic definitions
- ☑ <http://www.statlets.com/> Statlets by NWP Associates and <http://www.stat.sc.edu/webstat/> WEBstats

HOMEWORK FORMAT

- **Make it useful to you:** although answers are given at the end of the textbook, try to solve the problems on your own; the correct answer is useless if you do not know how to obtain it.
- **Make it easy to find/read:** label your products with your name, the homework number and date, and page numbers.
- **Make it easy to understand:** Include computations, in preparation for tests. For printouts, briefly state and interpret results referring to them; **state conclusions**--don't leave the reader guessing; when using SPSS restate in words what you believe your results mean in terms of the question.
- **Make it complete:** the (max) 2 points are given for effort & for tackling all questions, rather than for correct answers.

HOMEWORK SCHEDULE

DUE	FROM KACHIGAN (numbers represent chapter.problem number) <small>(tentative -- changes are expected & will be announced in class; if not taught in class, not required; due on Mondays)</small>
3. 1.28	<ul style="list-style-type: none"> ▪ 1.5, 1.6, 1.8, 1.11; 2.2, 2.6, 2.11, 2.18, 2.19, 2.20.
4. 2.4	<ul style="list-style-type: none"> ▪ 3.1 – 5, 3.9, 3.10-11 (see below), 3.12, 3.15, 4.5, 4.10 - 11, 4.16, 4.19, 4.21, 4.23, 4.25. ▪ Spreadsheet: Use Kachigan data; state your findings and where appropriate provide interpretations. <ul style="list-style-type: none"> ✓ Enter the data of problem 3.10 in the spreadsheet. Answer questions of 3.10 and 3.11. Same for 3.15.
5. 2.11	<ul style="list-style-type: none"> ▪ 5.7-9, 5.15, 5.17, 5.21, 5.23, 5.25, 5.27, 5.29-32 ▪ Spreadsheet: create your own data <ul style="list-style-type: none"> ✓ Create a sample of at least 25 observations on a variable of your choice (go on the WEB for ideas!) ✓ Produce and graph the frequency distribution of the sample; compute mode, median, mean, variance, std. deviation.
7. 2.25	<ul style="list-style-type: none"> ▪ 7.3, 7.5, 7.7-8, 7.12, 7.18, 7.23-25, 7.35, 7.37, 7.40
9. 3.10	<ul style="list-style-type: none"> ▪ 8.6, 8.7, 8.8, 8.10-11, 8.14, 8.18, 8.21, 8.22
11. 3.24	<ul style="list-style-type: none"> ▪ 9.2, 9.5, 9.7, 9.9, 9.11, 9.18, 9.20, 9.22, 9.25, 9.28
13. 4.7	<ul style="list-style-type: none"> ▪ 10.8, 10.9, 10.10, 10.11, 10.13, 10.21, 10.23, 10.28
15. 4.21	<ul style="list-style-type: none"> ▪ 11.3, 11.4, 11.6, 11.7, 8, 11.9-11, 11.13, 11.16, 11.19, 11.25
16. 4.28	<ul style="list-style-type: none"> ▪ 13.7, 13.11-12, 123.14, 13.16-17, 13.19-22 Hand in MathCAD lab outputs

DUE	SPSS & MATHCAD HOMEWORKS
9: 3.17	<ul style="list-style-type: none"> ▪ SPSS: Use GSS91 and STATES data; state your findings, and where appropriate provide interpretations. <ul style="list-style-type: none"> ✓ GSS91: Compute a 95% confidence interval for the mean preference for SOCFREND (spending a social evening with friends). ✓ States50: Compute a 99% confidence interval for docsp (PHYSICIANS PER 100,000 POP, 1985) ✓ States50: Compute a 95% confidence interval for age3 (% 15 TO 24 YEARS 1984)
10: 3.24	<ul style="list-style-type: none"> ▪ SPSS: Use GSS91 & GSS96 data. <ul style="list-style-type: none"> ✓ Compute a confidence interval for the difference between the two means (for 1991 and 1996) of a quantitative variable of your choice. Does it seem that the two means are different? How can you tell? ✓ For GSS91, Test at .05 whether respondents were drawn from a population whose mean preference for spending a social evening with friends (SOCFREND) is more than 3.50 on a 7-point scale. ✓ For GSS91, selecting only women (SEX = 2) who worked part-time during the previous week (WRKSTAT = 2) test at .01 whether the mean number of hours they worked (HRS1) was more than 20.
14: 4.14	<ul style="list-style-type: none"> ▪ SPSS: Use GSS91 data <ul style="list-style-type: none"> ✓ Some sociologists argue that a person's education level is related to the extent of liberal political and economic values. Test this argument by correlating individuals' self-rated degree of conservatism (POLVIEWS) to years of education (EDUC). Examine the significance of the correlation coefficient: compare to $\alpha = .01$ (one-tail test). Interpret your results. ✓ Is age linearly related to political outlook? Check the correlation between POLVIEWS and AGE; report the coefficient.