NEW COURSE FORM

1. General Information.

a. Submitted by the College of: Education Today's Date: 2.5.11

b. Department/Division: ducational Policy Studies & Evaluation AND Educational, School, & Counseling Psychology

c. Contact person name: Kelly Bradley or Michael Toland Email: kbrad2@uky.edu or toland.md@uky.edu Phone: 257-4923 or 257-3395

d. Requested Effective Date: ☒ Semester following approval OR ☐ Specific Term/Year[1]: _____

2. Designation and Description of Proposed Course.

a. Prefix and Number: EPE 711

b. Full Title: Advanced Quantitative Methods

c. Transcript Title (if full title is more than 40 characters): _____

d. To be Cross-Listed[2] with (Prefix and Number): EDP 711

e. Courses must be described by at least one of the meeting patterns below. Include number of actual contact hours[3] for each meeting pattern type.

2 Lecture 2 Laboratory[1] _____ Recitation _____ Discussion _____ Indep. Study

_____ Clinical _____ Colloquium _____ Practicum _____ Research _____ Residency

_____ Seminar _____ Studio _____ Other – Please explain: _____

f. Identify a grading system: ☒ Letter (A, B, C, etc.) ☐ Pass/Fail

g. Number of credits: 3

h. Is this course repeatable for additional credit? YES ☒ NO ☐

If YES: Maximum number of credit hours: 12

If YES: Will this course allow multiple registrations during the same semester? YES ☒ NO ☐

i. Course Description for Bulletin: This course is intended to familiarize students with advanced quantitative techniques. Topics include structural equation modelling, item response theory, rasch modelling, hierarchial linear modelling, and data mining. Other specific analysis techniques may also be explored.

j. Prerequisites, if any: Intermediate Statistics

k. Will this course also be offered through Distance Learning? YES[4] ☐ NO ☒

l. Supplementary teaching component, if any: ☐ Community-Based Experience ☐ Service Learning ☐ Both

3. Will this course be taught off campus? YES ☐ NO ☒

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[1] Courses are typically made effective for the semester following approval. No course will be made effective until all approvals are received.

[2] The chair of the cross-listing department must sign off on the Signature Routing Log.

[3] In general, undergraduate courses are developed on the principle that one semester hour of credit represents one hour of classroom meeting per week for a semester, exclusive of any laboratory meeting. Laboratory meeting, generally, represents at least two hours per week for a semester for one credit hour. (from *SR 5.2.1*)

[4] You must *also* submit the Distance Learning Form in order for the proposed course to be considered for DL delivery.

NEW COURSE FORM

4. Frequency of Course Offering.

a. Course will be offered (check all that apply): ☒ Fall ☒ Spring ☐ Summer

b. Will the course be offered every year? YES ☒ NO ☐

If NO, explain: _____

5. Are facilities and personnel necessary for the proposed new course available? YES ☒ NO ☐

If NO, explain: _____

6. What enrollment (per section per semester) may reasonably be expected? _____

7. Anticipated Student Demand.

a. Will this course serve students primarily within the degree program? YES ☒ NO ☐

b. Will it be of interest to a significant number of students outside the degree pgm? YES ☒ NO ☐

If YES, explain: This course will be for all graduate level students interested in specific quantitative techniques. Enrollment will come from students from the College of Education, Business, Communications, Statistics, Public Heath, and others.

8. Check the category most applicable to this course:

☒ Traditional – Offered in Corresponding Departments at Universities Elsewhere

☐ Relatively New – Now Being Widely Established

☐ Not Yet Found in Many (or Any) Other Universities

9. Course Relationship to Program(s).

a. Is this course part of a proposed new program? YES ☐ NO ☒

If YES, name the proposed new program: _____

b. Will this course be a new requirement[5] for ANY program? YES ☐ NO ☒

If YES[5], list affected programs: _____

10. Information to be Placed on Syllabus.

a. Is the course 400G or 500? YES ☐ NO ☒

If YES, the *differentiation for undergraduate and graduate students must be included* in the information required in ***10.b***. You must include: (i) identification of additional assignments by the graduate students; and/or (ii) establishment of different grading criteria in the course for graduate students. (See *SR 3.1.4.*)

b. ☒ The syllabus, including course description, student learning outcomes, and grading policies (and 400G-/500-level grading differentiation if applicable, from ***10.a*** above) are attached.

[5] In order to change a program, a program change form must also be submitted.

NEW COURSE FORM

Signature Routing Log

General Information:

Course Prefix and Number: EPE and EDP 711

Proposal Contact Person Name:	Kelly Bradley and Michael Toland	Phone: 257-4923 or 257-3395	Email: kbrad2@uky.edu or toland.md@uky.edu

INSTRUCTIONS:

Identify the groups or individuals reviewing the proposal; note the date of approval; offer a contact person for each entry; and obtain signature of person authorized to report approval.

Internal College Approvals and Course Cross-listing Approvals:

Reviewing Group	Date Approved	Contact Person (name/phone/email)	Signature
EDP	9/7/11	Fred Danner 7-7878 fdanner@uky.edu	Fred Danner
EPE	9/7/11	Alan DeYoung 7-3846 AJDEY@UKY.EDU	
		/ /	
		/ /	
		/ /	

External-to-College Approvals:

Council	Date Approved	Signature	Approval of Revision[6]
Undergraduate Council			
Graduate Council		Dr. Brian A. Jackson Digitally signed by Dr. Brian A. Jackson DN: cn=Dr. Brian A. Jackson, o=University of Kentucky, ou=Graduate School, email, c=US Date: 2011.09.12 11:11:22 -04'00'	
Health Care Colleges Council			
Senate Council Approval		University Senate Approval	

Comments:

[6] Councils use this space to indicate approval of revisions made subsequent to that council's approval, if deemed necessary by the revising council.

EPE/EDP 711 Advanced Quantitative Methods

Instructor will vary by topic.
Credit Hours: 3 credit hours per class, repeatable up to 12 hours

Class Meetings: Class will meet 2.5 hours per week, in either 140 or 245 TEB (computer smart classrooms)

Course Goals and Prerequisites:
The goal of this course is to provide students with knowledge of how to perform advanced quantitative methods useful in answering questions using observational or experimental data. It will allow them to more critically review research published that claims to answer such questions. The prerequisite is the first two semesters of quantitative methods, with a minimum of intermediate statistics or the equivalent as approved by the instructor.

Course Description: This course will provide students with an overview of the theory and applications of advanced quantitative methods. A quantitative research method focuses on advanced quantitative methodologies used in methodologically-oriented studies in educational measurement, evaluation, and statistics. The goal of this course is to prepare students to analyze data using advanced quantitative methods. It covers topics in the areas of Rasch Modeling, Item Response Theory, Structural Equation Modeling, Multilevel Modeling, and Data Mining (as well as additional techniques). Given the advanced nature of the course, we will not shy away from using the mathematical tools needed to develop the conceptual understanding. But the emphasis of the course will be on the conceptual understanding and application of the tools rather than on the math or the mechanics behind the tools.

Student Learning Objectives: The ultimate objective is that by the end of this course you will be able to:

- Conceptually understand the statistical methods covered in the course and how they can be applied to analyze a variety of issues
- Interpret the results of quantitative analyses and think critically about the potential issues that arise when trying to draw conclusions from such results
- Conduct analyses using appropriate measurement and/or statistical package(s)
- Prepare a proposal or manuscript for publication using at least one of the measurement or statistical models used in the course

Grading: Grading will be based on approximately 3 homework (totaling 60%), one final project or final exam (30%) and class participation (10%) that will involve both data analysis and a thoughtful description of both the analysis and the findings. One homework will involve a class presentation. Depending on the size of the class, some assignments may be done in groups.

Grading scale for graduate students will be earned as follows:
A: 90% ≤ Final Course % ≤ 100%
B: 80% ≤ Final Course % < 90%
C: 70% ≤ Final Course % < 80%
E: Final Course % < 70%

Academic Integrity:
Per university policy, students shall not plagiarize, cheat, or falsify or misuse academic records. Students are expected to adhere to University policy on cheating and plagiarism in all courses. The minimum penalty for a first offense is a zero on the assignment on which the offense occurred. If the offense is considered severe or the student has other academic offenses on their record, more serious penalties, up to suspension from the university may be imposed.

Plagiarism and cheating are serious breaches of academic conduct. Each student is advised to become familiar with the various forms of academic dishonesty as explained in the Code of Student Rights and Responsibilities. Complete information can be found at the following website: http://www.uky.edu/Ombud. A plea of ignorance is not acceptable as a defense against the charge of academic dishonesty. It is important that you review this information as all ideas borrowed from others need to be properly credited.

Part II of *Student Rights and Responsibilities* (available online http://www.uky.edu/StudentAffairs/Code/part2.html) states that all academic work, written or otherwise, submitted by students to their instructors or other academic supervisors, is expected to be the result of their own thought, research, or self-expression. In cases where students feel unsure about the question of plagiarism involving their own work, they are obliged to consult their instructors on the matter before submission.

When students submit work purporting to be their own, but which in any way borrows ideas, organization, wording or anything else from another source without appropriate acknowledgement of the fact, the students are guilty of plagiarism. Plagiarism includes reproducing someone else's work, whether it be a published article, chapter of a book, a paper from a friend or some file, or something similar to this. Plagiarism also includes the practice of employing or allowing another person to alter or revise the work which a student submits as his/her own, whoever that other person may be.

Students may discuss assignments among themselves or with an instructor or tutor, but when the actual work is done, it must be done by the student, and the student alone. When a student's assignment involves research in outside sources of information, the student must carefully acknowledge exactly what, where and how he/she employed them. If the words of someone else are used, the student must put quotation marks around the passage in question and add an appropriate indication of its origin. Making simple changes while leaving the organization, content and phraseology intact is plagiaristic. However, nothing in these Rules shall apply to those ideas which are so generally and freely circulated as to be a part of the public domain (Section 6.3.1).

Please note: Any assignment you turn in may be submitted to an electronic database to check for plagiarism.

Accommodations due to disability:
If you have a documented disability that requires academic accommodations, please see me as soon as possible during scheduled office hours. In order to receive accommodations in this course, you must provide me with a Letter of Accommodation from the Disability Resource Center (Room 2, Alumni Gym, 257-2754, email address: jkarnes@email.uky.edu) for coordination of campus disability services available to students with disabilities.

Attendance, Participation, Classroom Behavior, Decorum, and Civility: You are expected to come to all classes on-time, complete reading assignments, and participate in all activities and discussions. The instructor understands that some absences are unpreventable. However, students missing in excess over one-fifth of class meetings will result in a denial of course credit and be awarded a grade of W for the course. The following are non-penalized acceptable reasons for missing class beyond the one exception: serious illness, illness or death of family member, University-related trips, major religious holidays, and other circumstances the instructor finds to be reasonable cause for nonattendance. If warranted, the instructor will ask for verification of a missed class and if acceptable be allowed to complete any missed work as arranged by the instructor. Be sure to **turn off** your cell phone and/or pagers prior to each class. Avoid being tardy, as arriving late to class disturbs the other class members and instructor. Be respectful and civil while others are participating in dialogue in the course. Ultimately, treat others how you want to be treated.

Submission of Work: All assessments are due on the due date specified in the course schedule. **LATE ASSESSMENTS WILL BE ACCEPTED AT THE SOLE DISCRETION OF THE INSTRUCTOR.** Exceptions will be made ONLY in extreme circumstances, such as (but not limited to) an incapacitating illness or injury, or a death in the family. Since the course materials are posted on Blackboard, events such as (but not limited to) vacation/travel plans, social obligations, or family gatherings do not constitute exceptions. Turn in all work using the last 4 digits of your UK student identification number. DO NOT WRITE YOUR NAME ON ANY ASSESSMENT IN THIS COURSE except the final paper. All homework and reworked homework are to be submitted in hard copy – typed; hand-written work will not be accepted. E-mailed homework will NOT be accepted. However, the final paper is to be included on a CD along with a hard copy of your final paper. All work should follow APA guidelines (6th ed.).

Outline of course topics and readings: The following outline describes the topics that will be covered in sections of 711. The variety of topics is why this course is repeatable for up to 12 hours. Associated readings for each course are provided; however, specific text book requirements and reading list will be supplied by the individual instructor per class.

Rasch Modeling

Rasch analysis constructs linear measures from scored observations, such as responses to multiple-choice questions, Likert scales and quality-of-life assessments. This course covers the practical aspects of data setup, analysis, output interpretation, fit analysis, differential item functioning, dimensionality and reporting.

- Wright, B. D., & Masters, G. M. (1982). *Rating scale analysis*. Chicago, IL: Mesa Press.
- Wright, B. D., & Stone, M. H. (1979). *Best test design*. Chicago, IL: Mesa Press.
- Bond & Fox (2007). Applying the Rasch Model: Fundamental Measurement in the Human Sciences. 2nd ed.
- Winsteps Manual, available for download at www.winsteps.com
- Rasch Measurement Transactions & SIG Activity; http://www.rasch.org/rmt/

Item Response Theory

The course of item response theory (IRT) will introduce specific terminologies, models, and computer programs of IRT and apply them to educational and psychological test data. In the first phase, we will focus on development and difference between classical test theory (CTT) and IRT, as well as their application fields. In the second phase, we will focus on several practical fields of applications of IRT models, such as model-data fit, test equating, differential item functioning, test construction, and computerized adaptive testing.

- De Ayala, R. J. (2009). *The Theory and Practice of Item Response Theory*. New York, NY: Guilford.*
- Hambleton, R.K., Swaminathan, H., & Rogers, H.J. (1991). *Fundamentals of item response theory.* Newbury Park: Sage.
- Introduction to Item Response Theory (1991), Hambleton, Swaminathan, & Rogers, Sage Series: Measurement Methods in the Social Sciences (R. Jaeger, Ed.)
- Item response theory: principles & applications (1985). Hambleton & Swaminathan. Boston: Kluwer Publishing
- Applications of item response theory to practical testing problems, Lord, F. Hillsdale, NJ: Lawrence Erlbaum Associates
- Item response theory: parameter estimation techniques, Baker, F. B. (1992). New York: Marcel Dekker, Inc.

Structural Equation Modeling

Theory, application, interpretation of Structural Equation Modeling (SEM) techniques. Includes covariance structures, path diagrams, path analysis, model identification, estimation, and testing. Additional topics include: covariance structures, path diagrams, path analysis, model identification, estimation, and testing.

- Kline, R. B. (2005). *Principles and practice of structural equation modeling* (2nd Ed). *NewYork: Guilford Press*.
- Byrne, B. B. (2010). *Structural equation modeling using AMOS. Basic concepts, applications, and programming* (2nd Ed). New York: Routledge.
- Brown, Timothy A., Confirmatory Factor Analysis for Applied Research. London: The Guilford Press, 2006.
- Muthén, Linda K. & Bengt O. Muthén, M*plus* User's Guide (5th ed.). Los Angeles: Muthén & Muthén, 2007

Multilevel Modeling

Introduction to multilevel modeling and hierarchical data structures, random and fixed effects, intercepts and slopes as outcomes models, estimation, centering, emphasis on two level models, use and interpretation of statistical software. Advanced topics in multilevel modeling and hierarchical data structures including three level models with random and fixed effects, longitudinal models, multilevel models for binary and categorical outcomes.

- Raudenbush, S.W. & Bryk, A.S (2002) . Hierarchical Linear Models: Applications and Data Analysis Methods, 2nd Ed. Thousand Oaks CA: Sage.
- Kreft, I.G.G & DeLeeuw, J. (1998) Introducing Multilevel Modeling. Thousand Oaks CA: Sage.
- Bosker, R.J. & Snijders (1999) Multilevel Analysis: An Introduction to Basic and Advanced Multilevel Modeling. Thousand Oaks CA: Sage.

Data Mining

Data Mining attempts to identify interesting structural patterns in large data sets that can be used to make future predictions. This course will introduce fundamental strategies and methodologies for data mining along with the concepts underlying them, and will provide hands-on experience with a variety of different techniques Exploration of data mining methodologies. Topics may include decision tables, decision trees, classification rules, association rules, clustering, statistical modeling, and linear models.

- Margaret Dunham (2003) Data Mining Introductory and Advanced Topics, Prentice Hall.
- Jiawei Han and Micheline Kamber (2005) Data Mining Concepts and Techniques, Morgan Kaufmann, 2nd Ed.
- Pang-Ning Tan, Michael Steinbach, and Vipin Kumar (2005) Introduction to Data Mining, Addison Wesley.

** Additional Topics will be introduced depending on student needs and faculty interests

Week	Date	Topic	Readings from De Ayala (2009)*	Due
1	Aug. 25	Introduction to Measurement	Preface & Ch. 1	
2	Aug. 30	The One-Parameter Model	Ch. 2	
2	Sept. 1	The One-Parameter Model	Ch. 2	
3	Sept. 6	The One-Parameter Model	Ch. 2	
3	Sept. 8	Joint Maximum Likelihood Parameter Estimation	Ch. 3	
4	Sept. 13	Joint Maximum Likelihood Parameter Estimation	Ch. 3	
4	Sept. 15	Joint Maximum Likelihood Parameter Estimation	Ch. 3	
5	Sept. 20	Marginal Maximum Likelihood Parameter Estimation	Ch. 4	**HW#1**
5	Sept. 22	Marginal Maximum Likelihood Parameter Estimation	Ch. 4	
6	Sept. 27	Marginal Maximum Likelihood Parameter Estimation	Ch. 4	
6	Sept. 29	Marginal Maximum Likelihood Parameter Estimation	Ch. 4	
7	Oct. 4	The Two-Parameter Model	Ch. 5	**HW#2**
7	Oct. 6	The Two-Parameter Model	Ch. 5	
8	Oct. 11	The Two-Parameter Model	Ch. 5	
8	Oct. 13	The Three-Parameter Model	Ch. 6	
9	Oct. 18	The Three-Parameter Model	Ch. 6	
9	Oct. 20	The Three-Parameter Model	Ch. 6	
10	Oct. 25	Rasch Models for Ordered Polytomous Data	Ch. 7	**HW#3**
10	Oct. 27	Rasch Models for Ordered Polytomous Data	Ch. 7	
11	Nov. 1	Rasch Models for Ordered Polytomous Data	Ch. 7	
11	Nov. 3	Rasch Models for Ordered Polytomous Data	Ch. 7	
12	Nov. 8	Rasch Models for Ordered Polytomous Data	Ch. 7	
12	Nov. 10	Non-Rasch (IRT) Models for Ordered Polytomous Data	Ch. 8	
13	Nov. 15	Non-Rasch (IRT) Models for Ordered Polytomous Data	Ch. 8	
13	Nov. 17	Non-Rasch (IRT) Models for Ordered Polytomous Data	Ch. 8	
14	Nov. 22	Non-Rasch (IRT) Models for Ordered Polytomous Data	Ch. 8	**HW#4**
14	**Nov. 24**	**HOLIDAY (NO CLASS)**		
15	Nov. 29	Linking and Equating	Ch. 11	
15	Dec. 1	Linking and Equating	Ch. 11	**Draft of Paper**
16	Dec. 6	Differential Item Functioning	Ch. 12	
16	Dec. 8	Differential Item Functioning	Ch. 12	
17	Dec. 12	Turn in Final Paper		**Final Paper**