NEW COURSE FORM

1.	**General Information.**					
a.	Submitted by the College of:	Education			Today's Date:	2.5.11
b.	Department/Division:	Educational 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	.5 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 ☒

[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.

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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	2/9/11	Fred Danner / 7-7878 / fdanner@uky.edu	Fred Danner
EPE	2/10/11	A Bradley / 75846 / ajbrad@uky.edu	AB
		/ /	
		/ /	
		/ /	

External-to-College Approvals:

Council	Date Approved	Signature	Approval of Revision[6]
Undergraduate Council			
Graduate Council			
Health Care Colleges Council			
Senate Council Approval		University Senate Approval	

Comments:

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[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. 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

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.

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.

- 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. and Bengt O. Muthén, Mplus User's Guide (5 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