June 4, 2015

MEMORANDUM

TO: Donna Wiseman  
Dean, College of Education

FROM: Elizabeth Beise  
Associate Provost for Academic Planning and Programs

SUBJECT: Proposal to Modify the Ph.D. in Measurement, Statistics, and Evaluation (PCC log no. 14042)

At its meeting on April 3, 2015, the Senate Committee on Programs, Curricula and Courses approved the proposal to modify the Ph.D. in Measurement, Statistics, and Evaluation. A copy of the approved proposal is attached.

The change is effective Fall 2015. Please ensure that the change is fully described in the Graduate Catalog and in all relevant descriptive materials.

MDC/  
Enclosure

cc: Gregory Miller, Chair, Senate PCC Committee  
Barbara Gill, Office of Student Financial Aid  
Reka Montfort, University Senate  
Erin Taylor, Division of Information Technology  
Pam Phillips, Institutional Research, Planning & Assessment  
Anne Turkos, University Archives  
Linda Yokoi, Office of the Registrar  
Alex Chen, Graduate School  
Maggie McLaughlin, College of Education  
Nathan Fox, Department of Human Development and Quantitative Methodology
THE UNIVERSITY OF MARYLAND, COLLEGE PARK
PROGRAM/CURRICULUM/UNIT PROPOSAL

- Please email the rest of the proposal as an MSWord attachment to pcc-submissions@umd.edu.
- Please submit the signed form to the Office of the Associate Provost for Academic Planning and Programs, 1119 Main Administration Building, Campus.

College/School: Education
Please also add College/School Unit Code-First 8 digits: 01203100
Unit Codes can be found at: https://hypprod.umd.edu/Htmreports/Units.htm

Department/Program: Human Development and Quantitative Methodology / Measurement, Statistics, and Evaluation Ph.D. program
Please also add Department/Program Unit Code-Last 7 digits: 1310801

Type of Action (choose one):
- Curriculum change (including informal specializations)
- Curriculum change for an LEP Program
- Renaming of program or formal Area of Concentration
- Addition/deletion of formal Area of Concentration
- Suspend/delete program

*Italicics indicate that the proposed program action must be presented to the full University Senate for consideration.

Summary of Proposed Action:

Overview
Quantitative methods is a dynamic field. New and improved methods are being developed all the time, in many cases enabled by advances in computing. In order to continue to produce graduates who are the best candidates for positions in academia, testing companies, and research agencies, we must be responsive to these changes. Indeed, such responsiveness is absolutely critical for our students to be able to participate in research on the cutting edge of quantitative methods, so that they themselves can uphold our program’s tradition of helping to define new methodological frontiers.

Toward this end, our faculty undertook a comprehensive review of all topics currently covered in our courses, of topics covered in courses within peer programs at other leading institutions, and of clear directions that the theoretical and applied branches of our field appear to be heading. Two results emerged. First, overall we remain a leader in terms of both the depth and breadth of the training that our students receive, something pointed out to us routinely by scholars and practitioners who host our students in competitive summer internships. Second, we wish to continue to stay ahead of our peers as best we can, by making sure that we keep pushing our curriculum forward. Sometimes this latter point is achieved by making refinements in individual courses (as seen in KUALI), sometimes it means eliminating courses altogether and salvaging their relevant content for inclusion elsewhere, and sometimes it means creating new courses entirely. Our proposed curriculum, based on our thorough internal and external environmental scan, includes all three types of changes.

The revised curriculum as proposed below reflects an increased reliance on model-based reasoning, exposure to more advanced modeling techniques, increased integration of coursework requiring computational methods, and as a result better alignment with our relatively new comprehensive portfolio assessment system. In the table to follow, the current Ph.D. program requirements are on the left, the proposed requirements in the middle, and the rationale for each specific proposed curricular change on the right. Proposed course omissions are designated in orange and additions in green. Finally, all graduate catalog course descriptions, and proposed updated course descriptions as per KUALI, are contained in the Appendix.
Departmental/Unit Contact Person for Proposal: Gregory R. Hancock, ghancock@umd.edu

APPROVAL SIGNATURES - Please print name, sign, and date. Use additional lines for multi-unit programs.

1. Department Committee Chair Ann A. Battle, PhD 1/23/15
2. Department Chair Nathan Fox 1/23/15
3. College/School PCC Chair Denis Sullivan 2/19/15
4. Dean Margaret M. Mahaffy 2/19/15
5. Dean of the Graduate School (if required) 2/19/15
6. Chair, Senate PCC Greg 2/19/15
7. University Senate Chair (if required) 6/14/2015
8. Senior Vice President and Provost
<table>
<thead>
<tr>
<th>Current</th>
<th>Proposed</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDMS610 Classroom Assessment</td>
<td>No longer required</td>
<td>Graduates are not getting positions that require much of this content; relevant content of interest is contained in the required EDMS623.</td>
</tr>
<tr>
<td>EDMS626 Instrumentation</td>
<td></td>
<td>Because the creation and utilization of instruments is such a large part of our graduates' job experience after graduation, we felt it important to require formal training to make them even more ready for their professional environment. (Updates as per KUALI.)</td>
</tr>
<tr>
<td>EDMS645 Quantitative Research Methods I</td>
<td>No longer required</td>
<td>Students entering a graduate program in our field would have already had this or an equivalent course prior to admission.</td>
</tr>
<tr>
<td>EDMS646 Quantitative Research Methods II</td>
<td>EDMS646 General Linear Models I</td>
<td>(Course still required, with updates as per KUALI).</td>
</tr>
<tr>
<td>EDMS647 Causal Inference and Evaluation Methods</td>
<td></td>
<td>A comprehensive, modern, and statistical treatment of causal evaluation research methods should be required of all graduates. While most of our students took this course as an elective, we are formalizing its requirement (with course updates as per KUALI).</td>
</tr>
<tr>
<td>EDMS651 Applied Multiple Regression Analysis</td>
<td>EDMS651 General Linear Models II</td>
<td>(Course still required, with updates as per KUALI).</td>
</tr>
<tr>
<td>EDMS653 Introduction to Multilevel Modeling</td>
<td></td>
<td>Data with multilevel structures are increasingly common; students should have a fundamental training in the relevant issues and proper analysis of such data.</td>
</tr>
<tr>
<td>EDMS657 Factor Analysis</td>
<td>EDMS657 Exploratory Latent and Composite Variable Methods</td>
<td>(Course still required, with updates as per KUALI).</td>
</tr>
<tr>
<td>EDMS722 Structural Modeling</td>
<td></td>
<td>All advisors make their students take this course due to the importance of its content; requiring it is merely a formalization of practice.</td>
</tr>
<tr>
<td>EDMS723 Latent Structure Models -- or -- EDMS724 Modern Measurement Theory</td>
<td>EDMS724 Modern Measurement Theory</td>
<td>Faculty with deep expertise in EDMS723 have retired. Requiring EDMS724 specifically also ensures that our students have a detailed treatment of psychometric models and methods, which is increasingly important for practitioners in our field, especially testing settings.</td>
</tr>
<tr>
<td>EDMS771 Multivariate Data Analysis</td>
<td>No longer required</td>
<td>Salient modern content was moved to EDMS657 (as per KUALI description of updated EDMS657).</td>
</tr>
<tr>
<td>EDMS779 Mathematical Foundations and Simulation Techniques</td>
<td>EDMS779 Mathematical Foundations and Simulation Techniques</td>
<td>(Course still required.)</td>
</tr>
<tr>
<td>EDMS787 Bayesian Inference and Analysis</td>
<td></td>
<td>Bayesian models offer increased analytical flexibility, and in order for our program to remain a leader in our field we should be requiring this training of all doctoral students. (See KUALI for new course proposal.)</td>
</tr>
<tr>
<td>Course</td>
<td>Description</td>
<td>Notes</td>
</tr>
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<td>-------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>----------------------------------------------------------</td>
</tr>
<tr>
<td>EDMS798 Special Problems in Education -- or -- EDMS769 Special Topics (9 credits)</td>
<td>These courses simply become options to choose from for increased elective coursework requirements (below).</td>
<td>Allows for greater flexibility of course selection to meet students' specific interests and needs.</td>
</tr>
<tr>
<td>Electives (12 credits)</td>
<td>Electives (21 credits), selected from EDMS and elsewhere by student and advisor. MATH/STAT courses 400 level and above; all others 600 level and above</td>
<td>Allows for greater flexibility of course selection to meet students' specific interests and needs.</td>
</tr>
<tr>
<td>EDMS899 Doctoral Dissertation Research (12 credits)</td>
<td>EDMS899 Doctoral Dissertation Research (12 credits)</td>
<td>(No change.</td>
</tr>
</tbody>
</table>

The updated Ph.D. program would thus look like this:

- **Core courses (33 credits)**
  - EDMS626 (Instrumentation)
  - EDMS646 (General Linear Models I)
  - EDMS647 (Causal Inference and Evaluation Methods)
  - EDMS651 (General Linear Models II)
  - EDMS655 (Introduction to Multilevel Modeling)
  - EDMS657 (Exploratory Latent and Composite Variable Methods)
  - EDMS722 (Structural Equation Modeling)
  - EDMS724 (Modern Measurement Theory)
  - EDMS779 (Mathematical Foundations and Simulation Techniques)
  - EDMS787 (Bayesian Inference and Analysis)

- **Elective courses (21 credits)**

- **EDMS899 Doctoral Dissertation Research (12 credits)**
Appendix

Graduate catalog course descriptions, and proposed updated course descriptions as per KUALI

EDMS 610 Classroom Assessment and Evaluation (3 credits)
Develop the understandings and skills needed to validly, reliably, and accurately assess student learning and to provide focused leadership in the area of classroom assessment.

EDMS 622 Theory and Practice of Standardized Testing (3 credits)
Prerequisite: EDMS461; or EDMS645.
Principles of interpretation and evaluation of aptitude, achievement, and personal-social instruments; theory of reliability and validity; prediction and classification; norm- and criterion-referenced testing concepts.

EDMS 623 Applied Measurement: Issues and Practices (3 credits)
Prerequisite: EDMS410. And EDMS645; or students who have taken courses with comparable content may contact the department.
Measurement theory and its application at an intermediate level; test development, validation and interpretation; issues and recent developments in measurement.

EDMS 626 Measurement Techniques For Research (3 credits)
Prerequisite: EDMS646.
Theory, development and applications of various measurement instruments and procedures. Questionnaires, interviews, rating scales, attitude scales, observational procedures, ecological approaches, Q-sort, semantic-differential, sociometry and other techniques.

KUALI -- EDMS 626 Instrumentation (3 credits)
Prerequisite: EDMS623.
Theory, development, and applications of various affective, cognitive, or behavioral measurement instruments and procedures, including questionnaire and test items, observational protocols, and cutting-edge innovative game and scenario-based assessments.

EDMS 635 Computer-Based Measurement (3 credits)
Prerequisite: EDMS623 and EDMS651.
Theory and technological developments in computer-based measurement, including computer adaptive testing, instructional testing, item banking, applications to non-cognitive measures, as well as comparisons to traditional methods.

EDMS 645 Quantitative Research Methods I (3 credits)
Research design and statistical applications in educational research: data representation; descriptive statistics; estimation and hypothesis testing. Application of statistical computer packages is emphasized.

EDMS 646 Quantitative Research Methods II (3 credits)
Prerequisite: EDMS645.
A second-level inferential statistics course with emphasis on analysis of variance procedures and designs. Assignments include student analysis of survey data. Application of statistical computer packages is emphasized.

KUALI -- EDMS 646 General Linear Models I (3 credits)
Prerequisite: EDMS645 or equivalent introductory statistics course.
A first post-introductory inferential statistics course, with emphasis on analysis of variance procedures and designs from within the general linear modeling framework. Assignments include student analysis of education and related data; application of statistical software packages is emphasized.

EDMS 647 Introduction to Program Evaluation (3 credits)
Prerequisite: EDMS645.
Overview of the program evaluation process; problems encountered in the practice of program evaluation.
KUALI -- EDMS 647 Causal Inference and Evaluation Methods (3 credits)
Prerequisite/Corequisite: EDMS651.
Counterfactual (potential outcomes) framework for causal inference, design/analysis strategies for confounder control, and specific best-practice applications to the evaluation of programs.

EDMS 651 Applied Multiple Regression Analysis (3 credits)
Prerequisite: EDMS646; or students who have taken courses with comparable content may contact the department.
Multiple regression and correlation analysis; trend analysis; hierarchical and stepwise procedures; logistic regression; computer programs for regression analysis.

KUALI -- EDMS 651 General Linear Models II (3 credits)
Prerequisite: EDMS646.
Multiple regression and correlation analysis; trend analysis; hierarchical and stepwise procedures; logistic regression, software for regression analysis.

EDMS 655 Introduction to Multilevel Modeling (3 credits)
Prerequisite: EDMS651; or students who have taken courses with comparable content may contact the department.
Introduction to multilevel models and methodology as strategies for modeling change and organizational effects.

EDMS 657 Factor Analysis (3 credits)
Prerequisite: EDMS651.
Development of models for factor analysis and their practical applications. Treatment of factor extraction, rotation, second-order factor analysis, and factor scores. Introduction to linear structural relations models.

KUALI -- EDMS 657 Exploratory Latent and Composite Variable Methods (3 credits)
Prerequisite: EDMS651.
Development of models for exploratory factor analysis and their practical applications. Additional topics will draw from latent class analysis, cluster analysis, mixture models, canonical correlation, multidimensional scaling, and configural frequency analysis.

EDMS 665 Survey of Advanced Data Analysis for School Systems (3 credits)
Prerequisite: EDMS651; or students who have taken courses with comparable content may contact the department.
Survey of advanced data analysis procedures applied to school systems. Students will learn about Hierarchical Linear Modeling (HLM), factor analysis for purposes of test construction and test validations, and special topics that utilize these.

KUALI -- EDMS 665 Data Analysis and Statistical Consulting (3 credits)
Prerequisite: EDMS651; or students who have taken courses with comparable content may contact the department.
Advanced data analysis procedures applied to real-world clients' problems arising in a wide variety of substantive research settings within and beyond education.

EDMS 722 Structural Modeling (3 credits)
Prerequisite: EDMS657.
Statistical theory and methods of estimation used in structural modeling; computer program applications; multisample models; mean structure models; structural models with multilevel data (e.g., sampling weights, growth models, multilevel latent variable models).

EDMS 723 Latent Structure Models (3 credits)
Prerequisite: EDMS623 and EDMS651.
Theoretical development and application of latent class models.

EDMS 724 Modern Measurement Theory (3 credits)
Prerequisite: EDMS623 and EDMS651.
Theoretical formulations of measurement from a latent trait theory perspective.
EDMS 738 Seminar in Special Problems in Measurement (1-3 credits)
Restriction: Permission of EDUC-Human Development and Quantitative Methodology department. Repeatable to 3 credits.
An opportunity for students with special interests to focus in depth on contemporary topics in measurement. Topics to be announced, but will typically be related to applied and theoretical measurement.

EDMS 747 Design of Program Evaluations (3 credits)
Prerequisite: EDMS626, EDMS651, and EDMS647. Or permission of instructor; and permission of EDUC-Human Development and Quantitative Methodology department.
Analysis of measurement and design problems in program evaluations.

EDMS 769 Special Topics in Applied Statistics in Education (1-4 credits)
Restriction: Permission of EDUC-Human Development and Quantitative Methodology department.
Designed primarily for students majoring or minoring in measurement, statistics or evaluation.

EDMS 771 Multivariate Data Analysis (3 credits)
Prerequisite: EDMS651.
Principal components, canonical correlation, discriminant functions, multivariate analysis of variance/covariance and other multivariate techniques.

EDMS 779 Seminar in Applied Statistics (1-3 credits)
Restriction: Permission of EDUC-Human Development and Quantitative Methodology department. And must be in Measurement, Statistics and Evaluation (Master's) program; or must be in Measurement, Statistics and Evaluation (Doctoral) program. Repeatable to 3 credits if content differs.
Enrollment restricted to students with a major or minor in measurement, statistics or evaluation. Seminar topics will be chosen by individual student interest.

KUALI -- EDMS 787 Bayesian Inference and Analysis (3 credits)
Restriction: Permission of EDUC-Human Development and Quantitative Methodology department.
Bayesian methodology is extremely useful in modeling innovative or complicated models and is becoming increasingly common in the social sciences. This course addresses Bayesian perspectives, how they differ from frequentist views, and the differences in how statistical inference is both viewed and done. The majority of this class will be spent learning common models and model fitting methods.

EDMS 798 Special Problems in Education (1-6 credits)
Restriction: Must be in Measurement, Statistics and Evaluation (Master's) program; or must be in Measurement, Statistics and Evaluation (Doctoral) program.
Master's, EDMS majors, or doctoral candidates who desire to pursue special research problems under the direction of their advisors may register for credit under this number.

EDMS 799 Master's Thesis Research (1-6 credits)
Restriction: Must be in a major within EDUC-Human Development and Quantitative Methodology department.
Registration required to the extent of 6 credits.

EDMS 879 Doctoral Seminar (1-3 credits)
Restriction: Permission of EDUC-Human Development and Quantitative Methodology department.
Seminar that supports analysis of doctoral projects and theses, and of other on-going research projects.

EDMS 888 Internship in Measurement and Statistics (3-12 credits)
Prerequisite: Open only to students advanced to candidacy for doctoral degree. Restriction: Permission of EDUC-Human Development and Quantitative Methodology department.
Provides internship experiences at a professional level of competence in a particular role with appropriate supervision. Credit not to be granted for experience accrued prior to registration. Open only to students advanced to candidacy for doctoral degree.

EDMS 898 Pre-Candidacy Research (1-8 credits)
EDMS 899 Doctoral Dissertation Research (1-8 credits)
Registration required to the extent of 12 credits.
Grandfather clauses for EDMS program changes

The proposed changes to the graduate programs in EDMS (certificate, master’s, and Ph.D.) would be effective for those students who first enroll in the programs in Fall 2015. For those students who first enrolled prior to Fall 2015, they would have the option of completing the new requirements or completing the old requirements. For those opting for the latter, there are slight changes given course availability of two courses, as delineated below.

**Graduate Certificate**

The required EDMS771 course would no longer be offered. Certificate students who had not yet taken EDMS771 would be expected to enroll in the EDMS657 course instead, as the modern content from EDMS771 would be moved to EDMS657.

**Master’s Program**

The required EDMS610 course would no longer be offered. The relevant content from this course would be moved to EDMS623, another required course in both the old and new requirements. Masters students who had not yet taken EDMS610 would be expected to enroll in an additional 3-credit elective course to meet the 30-credit expectation.

**Ph.D. Program**

The required EDMS610 course would no longer be offered. The relevant content from this course would be moved to EDMS623, another required course in both the old and new requirements. Doctoral students who had not yet taken EDMS610 would be expected to enroll in an additional 3-credit elective course to meet the minimum 60-credit expectation.

The required EDMS771 course would no longer be offered. Doctoral students who had not yet taken EDMS771 would be expected to enroll in the EDMS657 course instead, as the modern content from EDMS771 would be moved to EDMS657. If a student has already taken EDMS657, then a suitable 3-credit elective would then be added.