**LETTER OF NOTIFICATION – 3**

NEW OPTION, EMPHASIS or CONCENTRATION

(Maximum 18 semester credit hours of theory courses and 6 credit hours of practicum courses)

1. Institution submitting request: University of Arkansas Fayetteville

1. Contact person/title: Dr. Terry Martin, Vice Provost for Academic Affairs
2. Phone number/e-mail address: (479) 575-2151/tmartin@uark.edu
3. Proposed effective date: Fall 2016
4. Title of existing degree program: MS degree in Statistics and Analytics – not currently approved for distance delivery but we are also seeking this approval

 (Indicate if the degree listed above is approved for distance delivery)

1. CIP Code: 27.0501
2. Degree Code: 6530

8. Proposed name of new option/concentration/emphasis: We are requesting seven concentrations: statistics; business analytics; operations analytics; computational analytics; educational statistics & psychometrics; quantitative social science; and biological analytics.

9. Reason for proposed action: This cross-college interdisciplinary M.S. degree program

pulls from the considerable resources across campus and has created more collaborative teaching, service and research teams. The committee who created the degree program feels that these concentrations represent the needs of our students and the strengths of our faculty. These concentrations have been offered as areas of study, but we would like students to be recognized for the specific skill set each concentration provides with them listed on the transcript.

10. New option/emphasis/concentration objective:

**Objectives for Concentrations**:

Statistics

* To provide and foster knowledge, practices and skills from traditional advanced graduate level programs in mathematical statistics.
* To provide tools and experiences enabling our graduates to communicate effectively and work with practitioners in their field.
* To provide highly skilled practitioners to industry and academic leadership positions in society.

Business Analytics

* To provide and foster knowledge, practices and skills from traditional advanced graduate level programs in mathematical statistics.
* To provide tools and experiences enabling our graduates to communicate effectively and work with practitioners in their field.
* To provide highly skilled practitioners to industry and academic leadership positions in society.

Operations Analytics

* To provide and foster knowledge, practices and skills from traditional advanced graduate level programs in business analytics.
* To provide tools and experiences enabling our graduates to communicate effectively and work with practitioners in business analytics.
* To provide highly skilled practitioners to industry and academic leadership positions in society.

Computational Analytics

* To provide and foster knowledge, practices and skills from traditional advanced graduate level programs in computational analytics.
* To provide tools and experiences enabling our graduates to communicate effectively and work with practitioners in computational analytics.
* To provide highly skilled practitioners to industry and academic leadership positions in society.

Educational Stat & Psychometrics

* To provide and foster knowledge, practices and skills from traditional advanced graduate level programs in educational statistics and psychometrics.
* To provide tools and experiences enabling our graduates to communicate effectively and work with practitioners in educational statistics and psychometrics.
* To provide highly skilled practitioners to industry and academic leadership positions in society.

Quantitative Social Science

* To provide and foster knowledge, practices and skills from traditional advanced graduate level programs in the quantitative aspects of the social sciences.
* To provide tools and experiences enabling our graduates to communicate effectively and work with practitioners in the quantitative aspects of the social sciences.
* To provide highly skilled practitioners to industry and academic leadership positions in society.

Biological Analytics

* To provide and foster knowledge, practices and skills from traditional advanced graduate level programs in data driven biological analysis.
* To provide tools and experiences enabling our graduates to communicate effectively and work with practitioners in data driven biological analysis.
* To provide highly skilled practitioners to industry and academic leadership positions in society.

11. Provide the following:

 a. Curriculum outline - List of courses in new option/concentration/emphasis – Underline

 required courses

 **Curriculum Outline**

 **Statistics**

* Undergraduate deficiencies: MATH 2564 Calculus II, CSCE 2014 Data Structures, MATH 3083 Linear Algebra
* Required core: One course from each of these areas as approved by the student’s advisory committee: Statistical Methods, Regression Analysis, Multivariate Analysis, Experimental Design
* Required for concentration: STAT 5103 Introduction to Probability Theory; STAT 5113 Statistical Inference; STAT 5333 Analysis of Categorical Responses; STAT 639V Statistical Computation
* Six additional hours of electives OR
* Six hours of thesis credit and submission of an acceptable thesis
* Written comprehensive exam (non-thesis) or defense of the thesis

**Business Analytics**

* Undergraduate deficiency: MATH 2554 Calculus I
* Required core: One course from each of these areas as approved by the student’s advisory committee: Statistical Methods, Regression Analysis, Multivariate Analysis, Experimental Design
* Required for concentration: ISYS 5113 IT Toolkit & Skills Seminar, ISYS 5833 Data Management Systems, ISYS 5843 Seminar in Business Intelligence and Knowledge Management
* Nine additional hours of electives OR
* Three additional hours of electives, six hours of thesis credit and submission of an acceptable thesis
* Written comprehensive exam (non-thesis) or defense of the thesis

 **Operations Analytics**

* Undergraduate deficiencies: MATH 2554 Calculus I, MATH 3083 Linear Algebra and STAT 3013 Introduction to Probability and Statistics
* Required core: One course from each of these areas as approved by the student’s advisory committee: Statistical Methods, Regression Analysis, Multivariate Analysis, Experimental Design
* Required for concentration: INEG 5613 Introduction to Optimization Theory, INEG 5803 Simulation and (One of the following)
* ISYS 5843 Seminar in Business Intelligence and Knowledge Management, CSCE 5073 Data Mining
* Nine additional hours of electives OR
* Three additional hours of electives, six hours of thesis credit and submission of an acceptable thesis
* Written comprehensive exam (non-thesis) or defense of the thesis

 **Computational Analytics**

* Undergraduate deficiencies: MATH 2554 Calculus I, MATH 3083 Linear Algebra and CSCE 4133 Algorithms
* Required core: One course from each of these areas as approved by the student’s advisory committee: Statistical Methods, Regression Analysis, Multivariate Analysis, Experimental Design
* Required for concentration: CSCE 4523 Database Management Systems, Two of the following: CSCE 5073 Data Mining, CSCE 5063 Machine Learning, CSCE 4613 Artificial Intelligence
* Nine additional hours of electives OR
* Three additional hours of electives, six hours of thesis credit and submission of an acceptable thesis
* Written comprehensive exam (non-thesis) or defense of the thesis

 **Educational Statistics & Psychometrics**

* Undergraduate deficiencies: MATH 2554 Calculus I and MATH 3083 Linear Algebra
* Required core: One course from each of these areas as approved by the student’s advisory committee: Statistical Methods, Regression Analysis, Multivariate Analysis, Experimental Design
* Required for concentration: ESRM 6653 Measurement and Evaluation, ESRM 5653 Educational Assessment, ESRM 6753 Advanced Measurement, ESRM 6993 Seminar in Psychometrics or Evaluation as approved by the student’s advisory committee
* Nine hours of electives as approved by the student’s advisory committee OR
* Three hours of electives and six hours of thesis credit and submission of an acceptable thesis
* Written comprehensive exam (non-thesis) or defense of the thesis

 **Quantitative Social Science**

* Undergraduate deficiencies: MATH 2554 Calculus I, MATH 3083 Linear Algebra and STAT 3013 Introduction to Probability and Statistics
* Required core: One course from each of these areas as approved by the student’s advisory committee: Statistical Methods, Regression Analysis, Multivariate Analysis, Experimental Design
* Required for concentration: ISYS 5723 Advanced Multivariate Analysis, ECON 6623 Econometrics II, ECON 4753 Forecasting, ECON 6633 Econometrics III
* Six hours of electives to include two of the following: cost benefit analysis; GIS and spatial analysis; multilevel modeling; social network analysis OR
* Six hours of thesis credit and submission of an acceptable thesis
* Written comprehensive exam (non-thesis) or defense of the thesis

 **Biological Analytics**

* Undergraduate deficiencies: MATH 2554 Calculus II, MATH 3083 Linear Algebra
* Required core: One course from each of these areas as approved by the student’s advisory committee: Statistical Methods, Regression Analysis, Multivariate Analysis, Experimental Design
* Required for concentration: CSCE 5013 Advanced Special Topics in Computer Science or Computer Engineering taken as Introduction to Cluster Computing, BIOL 5153 Practical Programming for Biologists; ISYS 5723 Advanced Multivariate Analysis
* Nine additional hours of electives OR
* Three additional hours of electives and six hours of thesis credit and submission of an acceptable thesis
* Written comprehensive exam (non-thesis) or defense of the thesis

b. Provide degree plan that includes new option/emphasis/concentration.

See attached degree plans – Appendix A.

c. Total semester credit hours required for option/emphasis/concentration

 (Option range: 9–24 semester credit hours)

The master’s degree requires 30 semester credit hours, 12 of which are the shared

core and 18 of which are distributed between required and elective classes in each

concentration as follows:

1. Statistics – 12 hours required/6 hours elective,
2. Business Analytics – 9 hours required/9 hours elective
3. Operations Analytics - 9 hours required/9 hours elective
4. Computational Analytics - 9 hours required/9 hours elective
5. Educational Statistics & Psychometrics - 12 hours required/6 hours elective
6. Quantitative Social Science - 12 hours required/6 hours elective
7. Biological Analytics - 9 hours required/9 hours elective

 d. New courses and new course descriptions: All courses are existing.

 e. Goals and objectives of program option

1. To provide and foster knowledge, practices and skills common to traditional first year graduate level programs in Statistics, Biological Analytics, Business Analytics, Operations Analytics, Computational Analytics, Quantitative Social Sciences, and Educational Statistics and Psychometrics.
2. To provide and foster knowledge, practices and skills from traditional advanced graduate level programs in one of the above disciplines.
3. To provide tools and experiences enabling our graduates to communicate effectively and work with practitioners in their field.
4. To provide highly skilled practitioners to industry and academic leadership positions in society.

 f. Expected student learning outcomes

1. Knowledge of covariance, hypothesis testing, etc.
2. Thorough knowledge of linear regression modeling and analysis.
3. Proficiency with regression in the context of many possibly collinear variables.
4. Thorough knowledge of the theory and design of statistical experiments.
5. Capability with software tools enabling general purpose statistical analysis.
6. Skill with programming tools and languages appropriate for one or more of the disciplines listed in Program Goals 1.
7. Ability to prepare and present statistical analyses.
8. Ability to communicate and collaborate effectively in both discipline specific and interdisciplinary team projects.

 g. Documentation that program option meets employer needs: Appendix B.

 h. Student demand (projected enrollment) for program option: There is currently very

high demand for each of the concentration areas; we expect demand to exceed our current ability to serve. Each concentration will have 6-12 graduates per year (enrollment of 12-24 students per concentration) until our resources grow to allow greater enrollment.

 i. Name of institutions offering similar program or program option and the institution(s) used as a model to develop the proposed program option: North Carolina State University, Arizona State University, Northeastern University, Georgia Tech University, Northwestern University, Iowa State University, Columbia University.

12. Institutional curriculum committee review/approval date: January 13, 2016.

13. Will the new option/emphasis/concentration be offered via distance delivery? Yes, we are

 seeking approval. If yes, indicate mode of distance delivery: On-line.

14. Explain in detail the distance delivery methods/procedures to be used: Please see attached LON 13.

15. Specify the amount of additional costs required for program implementation, the source

 of funds, and how funds will be used.

No additional funds are required to offer the concentrations.

16. Provide additional program information if requested by ADHE staff.

President/Chancellor Approval Date:

Board of Trustees Notification Date:

Chief Academic Officer Date: