DEPARTMENT OF MATHEMATICS, STATISTICS, AND PHYSICS

2012 SELF-STUDY REPORT

Table of contents

Pages

Program Review Self-Study Template………………………………… 1-21

Attachment #1 (External reviews describing the professional quality of our faculty)……………………………………………………….22-41

Attachment #2 (A) (Assessment plans and results. Undergraduate Programs)…………………………………………………………42-68

Attachment #2 (B) (Assessment plans and results. Graduate Programs)…………………………………………………………69-77

Attachment #3 (Cost comparison of producing one credit hour by our department (MSP) versus all WSU Colleges)………………………….78-80

Program Review Self-Study Template

Academic unit: Mathematics, Statistics, and Physics

College: LAS

Date of last review 2007

Date of last accreditation report (if relevant) ______________

List all degrees described in this report (add lines as necessary)

Degree: BA/BS Mathematics CIP* code:____________

Degree: BA/BS Physics CIP* code:____________

Degree: MS Mathematics CIP code:____________

Degree: PhD Mathematics CIP code:____________

*To look up, go to: Classification of Instructional Programs Website, http://nces.ed.gov/ipeds/cipcode/Default.aspx?y=55

Faculty of the academic unit (add lines as necessary)

Name (Signatures On File)

Abdelhamid Albaid - Instructor

Andrew Acker - Professor

Adam Anthony - Instructor

Mark Arrasmith - Instructor/Unclass Prof.

Elizabeth Behrman - Professor

Stephen Brady - Assoc. Prof.

Alexander Bukhgeym - Professor

Chunsheng Ma - Professor

Dharam Chopra - Professor

Daowei Ma - Professor

Thomas DeLillo - Professor

Sandra Derry - Instructor

Katherine Earles - Instructor

Alan Elcrat - Professor

Jason Ferguson - Assoc. Prof.

Buma Fridman - Chairman & Professor

Mustafa Hamdan - Instructor

Hussein Hamdeh - Professor

Xiaomi Hu - Assoc. Prof. ______________________

Victor Isakov - Professor ______________________

James Ho - Professor ______________________

Thalia Jeffres - Assoc. Prof. ______________________

Zhiren Jin - Professor ______________________

Buddy Johns - Assoc. Prof. ______________________

Lop-Hing Ho - Assoc. Prof. ______________________

Kirk Lancaster - Professor ______________________

Tianshi Lu - Asst. Prof. ______________________

Holger Meyer - Asst. Prof. ______________________

Kenneth Miller - Professor ______________________

Hari Mukerjee - Professor ______________________

Phillip Parker - Professor ______________________

Sandra Peer - Instructor/Unclass Prof. ______________________

William Richardson - Assoc. Prof. ______________________

Paul Scheuerman - Instructor/Unclass Prof. ______________________

Nickolas Solomey - Director of Physics & Professor ______________________

Ziqi Sun - Professor ______________________

Syed Taher - Assoc. Prof. ______________________

Jacie Ziegelbein - Instructor ______________________

Submitted by: Buma Fridman, Chairman & Professor Date 03/30/2012
(name and title)

1. Departmental purpose and relationship to the University mission (refer to instructions in the WSU Program Review document for more information on completing this section).

a. University Mission:

Wichita State University is committed to providing comprehensive educational opportunities in an urban setting. Through teaching, scholarship and public service the University seeks to equip both students and the larger community with the educational and cultural tools they need to thrive in a complex world, and to achieve both individual responsibility in their own lives and effective citizenship in the local, national and global community.

b. Program Mission (if more than one program, list each mission):

The mission of the undergraduate program in Mathematics and Statistics, is to provide a broadly based program in undergraduate level mathematics and statistics which will prepare students for either graduate study in mathematics and statistics or for mathematics-statistics related employment in academic, industrial or governmental positions. The undergraduate program is committed to providing the mathematical instruction needed by programs in business, education, engineering and health professions, as well as in the liberal arts and sciences.

The mission of the undergraduate program in Physics is to provide a broadly based, flexible program in undergraduate level physics which will prepare students for graduate study in physics or a related discipline or for physics-related employment in academic, industrial, or governmental positions. The undergraduate program is also committed to providing the physics instruction needed by programs in other sciences, engineering, education, and health professions, as well as in the liberal arts.

The mission of the M.S. program in Mathematics is to provide a broadly based, flexible program in graduate level mathematics and statistics which will prepare students for either doctoral study in mathematics and statistics; or for mathematics-statistics related employment in academic, industrial or governmental positions.

The mission of the Ph.D. program in Applied Mathematics is to provide a high quality doctoral program in applied mathematics that will prepare students to become research mathematicians in either academia, business or industry.

c. The role of the program (s) and relationship to the University mission: Explain in 1-2 concise paragraphs.

Our department supports the university's educational commitment to the state and community by providing instruction in mathematics and statistics at all levels from pre-college mathematics through doctoral study. The need for mathematics permeates the modern technological world and workplace. Because the extent of mathematical training and expertise required varies considerably according to profession, the department provides instruction for students with a wide variety of goals and at all levels from the baccalaureate to the doctoral.

Physics is the root of all sciences and engineering. Without a broad educational base in Physics programs in other sciences and in engineering would not have the solid foundation they need, nor would local industry be provided with the leadership necessary in diverse groups of scientists and engineers.

The Ph.D. program in applied mathematics was developed specifically to support the state's growing technology-dependent industries. It contributes to and will continue to contribute to the economic development of the state, and the Wichita metropolitan area in particular. The Ph.D. program aims directly at building and upgrading the mathematical resources needed to sustain the technological base of the state. It is designed to provide substantive expertise in areas that are vital to industry in order to promote effective competition in commercial, governmental and international markets.

The graduate faculty in the department contribute significantly to the university’s research mission. As reported in ScienceWatch.com on May 31, 2009, WSU ranks in the top 5 universities nationwide in the contribution of mathematics toward the university's total research productivity. Effective classroom teaching and continuing research activity by the faculty are equally important for the well-being and vitality of the programs offered by the department. Through their professional expertise, members of the faculty also provide service to the academic community as well as the industrial and commercial communities within the state.

d. Has the mission of the Program (s) changed since last review? ☐ Yes ☒ No
   i. If yes, describe in 1-2 concise paragraphs. If no, is there a need to change? No.

e. Provide an overall description of your program (s) including a list of the measurable goals and objectives of the program (s) (both programmatic and learner centered). Have they changed since the last review? ☐ Yes ☒ No

If yes, describe the changes in a concise manner.

The objectives of the undergraduate program in Mathematics and Statistics are:

- to provide students with a solid foundation in the major areas of mathematics and statistics and an understanding of the role of mathematics and statistics in applications;
- to prepare its graduates for either graduate study in mathematics and statistics, or for careers in teaching at the high school level or in any of a wide variety of mathematics and statistics based careers in science, industry and government, as well as other careers in which logical problem solving skills and precise thinking are valuable.

The objectives of the undergraduate program in Physics are:

- to provide a broadly based, flexible program in undergraduate level physics;
- to prepare its graduates for graduate study in physics or a related discipline or for physics-related employment in academic, industrial, or governmental positions.

The objectives of the MS program in Mathematics are:

- to provide students with a program of study in which they build on the knowledge acquired in an undergraduate program in mathematics and statistics by taking more advanced course work (and optionally thesis work) in certain areas of mathematics and/or statistics;
- to prepare its graduates for either
  - further study in mathematics and statistics at the PhD level,
  - a career in teaching at the high school or junior college level,
  - a career in science, industry or government that requires graduate level training in mathematics or statistics.

The objectives of the PhD program in Applied Mathematics are:

- to enable students to reach the forefront of knowledge in some area of applied mathematics and to expand knowledge in this area through original research while also acquiring a broad grasp of the current state of the field;
- to prepare its graduates for either an academic career in teaching at the college or university level or a non-academic research career as an applied mathematician, statistician or scientist.

For each program, the first of the above stated goals is assessed in terms of specific learning outcomes in Section 3c of this Self-Study. A summary analysis of the results of these assessment activities is that all targets were met in at least two of the three years, and most in every year.

Assessment of the second goal for each program is provided in Section 4. The MS program expects at least 85% of the graduates of the program to obtain mathematics-statistics related employment or admission to a doctoral program within one year of graduation. Also, at least 85% of the graduates of the Ph.D. program are expected to obtain mathematics, statistics or physics related employment within one year of graduation. The data presented in tables 4c and 4d indicate that these targets have been exceeded each year.

The Physics program has been growing steadily since 2008, has doubled over the three years of this study, and now attracts 12-15 new majors per year. We actively recruit new majors from area high schools and community colleges, and have instituted a new joint double major across colleges with the Engineering College which is very successful.

2a. Describe the quality of the program as assessed by the strengths, productivity, and qualifications of the faculty in terms of SCH, majors, graduates and scholarly productivity (refer to instructions in the WSU Program Review document for more information on completing this section). Complete a separate table for each program if appropriate.

Last 3 Years	Tenure/Tenure Track Faculty (Number)	Tenure/Tenure Track Faculty with Terminal Degree (Number)	Instructional FTE (#): TTF= Tenure/Tenure Track GTA=Grad teaching assist O=Other instructional FTE			Total SCH - Total SCH by FY from Su, Fl, Sp	Total Majors - From fall semester	Total Grads –by FY
			TTF	GTA	O			
Year 1→	23	23	22.5	8.5	20.8	23555	37	6
Year 2→	22	22	22.5	8.3	15.6	25251	45	3
Year 3→	21	21	20	8.9	16.0	26710	57	15

	Total Number Instructional (FTE) – TTF+GTA+O	SCH/ FTE	Majors/ FTE	Grads/ FTE
Year 1→	51.8	455	0.7	0.12
Year 2→	46.3	545	1.0	0.06
Year 3→	44.9	595	1.3	0.33

Scholarly Productivity	Number Journal Articles		Number Presentations		Number Conference Proceedings		Performances			Number of Exhibits		Creative Work		No. Books	No. Book Chaps	No. Grants Awarded or Submitted	$ Grant Value
	Ref	Non-Ref	Ref	Non-Ref	Ref	Non-Ref	*	**	***	Juried	****	Juried	Non-Juried				
Year 1 2008	31	0	14	6	4	0										6	948,994
Year 2 2009	18	0	17	2	3	0								2		7	1,770,549
Year 3 2010	16	0	14	5	4	0										8	2,192,749

UG Program – BS Mathematics (SCH from entire Mathematics Dept)

* Winning by competitive audition. **Professional attainment (e.g., commercial recording). ***Principal role in a performance. ****Commissioned or included in a collection. KBOR data minima for UG programs: Majors=25; Graduates=10; Faculty=3; KBOR data minima for master programs: Majors=20; Graduates=5; Faculty=3 additional; KBOR data minima for doctoral programs: Majors=5; Graduates=2; Faculty=2 additional.

a. Provide a brief assessment of the quality of the faculty/staff using the data from the table above as well as any additional relevant data. Programs should comment on details in regard to productivity of the faculty (i.e., some departments may have a few faculty producing the majority of the scholarship), efforts to recruit/retain faculty, departmental succession plans, course evaluation data, etc.

Provide assessment here:

In the Fall 2011 the MSP department had 29 tenure eligible faculty. 28 of them hold a Ph.D. degree, twenty six (89 %) had graduate faculty status. All of our graduate courses are taught by full-time, tenure-track faculty. The strengths of the graduate faculty consist of (i) research concentrations in areas related to the Ph.D. program in Applied Mathematics, (ii) recognized expertise in research and (iii) graduate instruction, training and mentorship.

(i) Faculty research areas include Analysis (partial differential equations, several complex variables, and calculus of variations), Differential Geometry and Mathematical Physics (pseudo-Riemannian manifolds, geometric flows), Numerical Analysis (numerical conformal mapping, computational fluid dynamics), Combinatorics and Statistics (spatio-temporal statistics, statistical computing, experimental design, mathematical statistics, and statistical procedures under constraints). Research interests such as inverse problems, integral geometry, free boundary problems, partial differential equations, probability and statistics overlap specific areas of Applied Mathematics with applications to the following areas:

- Tomography and Integral Geometry. Applications to geophysics and medicine (three dimensional pictures of internal organs of a human body by CAT and MRI scans).
- Determining obstacles and boundary conditions from scattering type data (in particular looking for size and location of cracks, say, in aging aircraft).
- Fluid mechanics. Discovery of different physical phenomena (vorticity and turbulence, for example) through the use of the appropriate mathematical models.
- Numerical Analysis. Solving of applied problems in various areas, such as fluid dynamics or mathematical physics, by using high speed computers.
- Carleman estimates and uniqueness and stability of the continuation for partial differential equations and related numerical algorithms (for example, determination of vibrations of surfaces from remote acoustical measurements).
- Survival Analysis.
- Financial mathematics.

Our concentrations in partial differential equations (8 graduate faculty) and probability and statistics (4 graduate faculty) together with graduate faculty research in several complex variables (3 faculty), differential geometry and mathematical physics (2 faculty) and numerical analysis allow our graduate students to obtain multiple perspectives of major areas of applied mathematics and statistics and to learn a large variety of complementary mathematical, computational and statistical techniques which will assist them in their careers.

(ii) Faculty research expertise is illustrated in many different ways:

In 2006, Victor Isakov was awarded the rank of Distinguished Professor of Mathematics. It was the first time in the (more than 100 years of) history of our department that our faculty member received such an award. We believe that this award, as well as many awards and recognitions our faculty have received year-after-year in the past 10-15 years, speaks to the quality of fundamental and applied research our department is involved in. Alan Elcrat (2000) and Victor Isakov (2001) won the WSU Excellence in Research Award. Chunsheng Ma (2005) and Christian Wolf (2007) won the WSU Young Faculty Scholar Award.

The high productivity of the math department measured in discoveries (articles) published in major professional journals of the world puts Wichita State among the top 5 universities in the nation. The results come from the Research Services Group of Thomson Reuters, a leading source of information analysis about basic research.

See http://sciencewatch.com/dr/sci/09/may31-09_1/
A copy of this page is included in Attachment #1.

Over the past three years one faculty has been promoted to Associate Professor, one – to Full Professor, seven successfully underwent Professor Incentive review. External experts have written about Mathematics & Statistics faculty in different contexts. One remark is in order. Starting 2010 we introduced the blind external evaluation for faculty applying for tenure and/or promotion. So due to confidentiality concerns we cannot exhibit these highly positive evaluation letters here. Same is true for other review letters talking of the research accomplishments of our faculty. So, we decided to include in Attachment #1 some of the previous (in years 2000-2010) letters characterizing the work of our existing faculty. So, a sample of letters from faculty at the University of Washington, University of Illinois, Oxford University, Stanford University, Rutgers University, and one Review for the Kansas NSF EPSCoR Award, and are included in Attachment # 1.

Mathematics, Statistics, and Physics faculty serve on editorial boards of academic research journals. Since the Ph.D. program in Applied Mathematics was initiated in 1985, faculty have received grants from well-known and highly competitive federal, state and local agencies such as the National Science Foundation, Department of Defense, Department of Energy, Air Force, Federal Aviation Administration and The Kansas Health Foundation.

Mathematics & Statistics faculty have given invited addresses at conferences and institutions throughout the world.

2b. Describe the quality of the program as assessed by the strengths, productivity, and qualifications of the faculty in terms of SCH, majors, graduates and scholarly productivity (refer to instructions in the WSU Program Review document for more information on completing this section). Complete a separate table for each program if appropriate.

Last 3 Years	Tenure/Tenure Track Faculty (Number)	Tenure/Tenure Track Faculty with Terminal Degree (Number)	Instructional FTE (#): TTF= Tenure/Tenure Track GTA=Grad teaching assist O=Other instructional FTE			Total SCH - Total SCH by FY from Su, Fl, Sp	Total Majors - From fall semester	Total Grads –by FY
			TTF	GTA	O			
Year 1→	6	6	6	2	1.4	5893	13	2
Year 2→	6	6	6.7	0.5	2.1	6271	18	2
Year 3→	6	6	6.7	1.5	1.8	5471	21	4

	Total Number Instructional (FTE) – TTF+GTA+O	SCH/ FTE	Majors/ FTE	Grads/ FTE
Year 1→	9.4	626	1.4	.21
Year 2→	9.3	674	1.9	.22
Year 3→	10	547	2.1	.30

Scholarly Productivity	Number Journal Articles		Number Presentations		Number Conference Proceedings		Performances			Number of Exhibits		Creative Work		No. Books	No. Book Chaps	No. Grants Awarded or Submitted	$ Grant Value
	Ref	Non-Ref	Ref	Non-Ref	Ref	Non-Ref	*	**	***	Juried	****	Juried	Non-Juried				
Year 1 2008	27	1		6	16	4								1	1	7	6,000
Year 2 2009	28	1		8	15	0										5	6,000
Year 3 2010	32	4		20	5	5								1		6	58,000

UG Program - BS Physics (SCH from Physics)

* Winning by competitive audition. **Professional attainment (e.g., commercial recording). ***Principal role in a performance. ****Commissioned or included in a collection. KBOR data minima for UG programs: Majors=25; Graduates=10; Faculty=3; KBOR data minima for master programs: Majors=20; Graduates=5; Faculty=3 additional; KBOR data minima for doctoral programs: Majors=5; Graduates=2; Faculty=2 additional.

a. Provide a brief assessment of the quality of the faculty/staff using the data from the table above as well as any additional relevant data. Programs should comment on details in regard to productivity of the faculty (i.e., some departments may have a few faculty producing the majority of the scholarship), efforts to recruit/retain faculty, departmental succession plans, course evaluation data, etc.

Provide assessment here:

The Physics faculty are very productive, as demonstrated by their high publication rate in top journals. Their expertise is recognized by invitations to give high profile talks at conferences and at leading academic institutions throughout the world. Prof Solomey is the editor of the journal Nuclear Physics B for a semiyearly conference, and is the chair of physics for arXiv, for 2003-2012. Three of our faculty have won teaching awards for excellence. Prof Ho holds the position of Trustees’ Distinguished Professor.

2c. Describe the quality of the program as assessed by the strengths, productivity, and qualifications of the faculty in terms of SCH, majors, graduates and scholarly productivity (refer to instructions in the WSU Program Review document for more information on completing this section). Complete a separate table for each program if appropriate.

Last 3 Years	Tenure/Tenure Track Faculty (Number)	Tenure/Tenure Track Faculty with Terminal Degree (Number)	Instructional FTE (#): TTF= Tenure/Tenure Track GTA=Grad teaching assist O=Other instructional FTE			Total SCH - Total SCH by FY from Su, Fl, Sp	Total Majors - From fall semester	Total Grads –by FY
			TTF	GTA	O			
Year 1→	13	13	5.75	0	0	N/A	21	8
Year 2→	10	10	4.25	0	0	N/A	21	4
Year 3→	11	11	4.75	0	0	N/A	25	10

	Total Number Instructional (FTE) – TTF+GTA+O	SCH/ FTE	Majors/ FTE	Grads/ FTE
Year 1→	N/A	N/A	N/A	N/A
Year 2→	N/A	N/A	N/A	N/A
Year 3→	N/A	N/A	N/A	N/A

Scholarly Productivity	Number Journal Articles		Number Presentations		Number Conference Proceedings		Performances			Number of Exhibits		Creative Work		No. Books	No. Book Chaps	No. Grants Awarded or Submitted	$ Grant Value
	Ref	Non-Ref	Ref	Non-Ref	Ref	Non-Ref	*	**	***	Juried	****	Juried	Non-Juried				
Year 1 2008	31	0	14	6	4	0										6	948,994
Year 2 2009	18	0	17	2	3	0								2		7	1,770,549
Year 3 2010	16	0	14	5	4	0										8	2,192,749

Graduate - MS

* Winning by competitive audition. **Professional attainment (e.g., commercial recording). ***Principal role in a performance. ****Commissioned or included in a collection. KBOR data minima for UG programs: Majors=25; Graduates=10; Faculty=3; KBOR data minima for master programs: Majors=20; Graduates=5; Faculty=3 additional; KBOR data minima for doctoral programs: Majors=5; Graduates=2; Faculty=2 additional.
*From the table on page 3, indicate number of faculty (and instructional FTE) teaching in the graduate program.

NOTE: Scholarly Productivity reported for all faculty with Full Graduate Faculty Status.

a. Provide a brief assessment of the quality of the faculty/staff using the data from the table above as well as any additional relevant data. Programs should comment on details in regard to productivity of the faculty (i.e., some departments may have a few faculty producing the majority of the scholarship), efforts to recruit/retain faculty, departmental succession plans, course evaluation data, etc.

   Provide assessment here: See 2a

2d. Describe the quality of the program as assessed by the strengths, productivity, and qualifications of the faculty in terms of SCH, majors, graduates and scholarly productivity (refer to instructions in the WSU Program Review document for more information on completing this section). Complete a separate table for each program if appropriate.

Last 3 Years	Tenure/Tenure Track Faculty (Number)	Tenure/Tenure Track Faculty with Terminal Degree (Number)	Instructional FTE (#): TTF= Tenure/Tenure Track GTA=Grad teaching assist O=Other instructional FTE			Total SCH - Total SCH by FY from Su, Fl, Sp	Total Majors - From fall semester	Total Grads –by FY
			TTF	GTA	O			
Year 1→	9	9	3.25	0	0	N/A	15	1
Year 2→	10	10	3	0	0	N/A	16	3
Year 3→	11	11	3.25	0	0	N/A	15	2
					Total Number Instructional (FTE) – TTF+GTA+O	SCH/ FTE	Majors/ FTE	Grads/ FTE
Year 1→					N/A	N/A	N/A	N/A
Year 2→					N/A	N/A	N/A	N/A
Year 3→					N/A	N/A	N/A	N/A

Scholarly Productivity	Number Journal Articles		Number Presentations		Number Conference Proceedings		Performances			Number of Exhibits		Creative Work		No. Books	No. Book Chaps	No. Grants Awarded or Submitted	$ Grant Value
	Ref	Non-Ref	Ref	Non-Ref	Ref	Non-Ref	*	**	***	Juried	****	Juried	Non-Juried				
Year 1 2008	26	0	14	6	4	0										6	948,994
Year 2 2009	18	0	16	2	3	0								2		7	1,770,549
Year 3 2010	16	0	14	5	4	0										8	2,082,749

PhD Program

* Winning by competitive audition. **Professional attainment (e.g., commercial recording). ***Principal role in a performance. ****Commissioned or included in a collection. KBOR data minima for UG programs: Majors=25; Graduates=10; Faculty=3; KBOR data minima for master programs: Majors=20; Graduates=5; Faculty=3 additional; KBOR data minima for doctoral programs: Majors=5; Graduates=2; Faculty=2 additional.
*From the table on page 3, indicate number of faculty (and instructional FTE) teaching in the graduate program.

NOTE: Scholarly Productivity reported for all faculty with Dissertation Chairing Status.

a. Provide a brief assessment of the quality of the faculty/staff using the data from the table above as well as any additional relevant data. Programs should comment on details in regard to productivity of the faculty (i.e., some departments may have a few faculty producing the majority of the scholarship), efforts to recruit/retain faculty, departmental succession plans, course evaluation data, etc.

Provide assessment here: See 2a

3. Academic Program: Analyze the quality of the program as assessed by its curriculum and impact on students. Complete this section for each program (if more than one). Attach updated program assessment plan (s) as an appendix (refer to instructions in the WSU Program Review document for more information).

a. For undergraduate programs, compare ACT scores of the majors with the University as a whole.

Last 3 Years	Total Majors - From fall semester		ACT – Fall Semester (mean for those reporting)		
	Math	Physics	Math	Physics	All University Students - FT
Year 1→	37	13	25.2	28.6	22.66
Year 2→	45	18	26.0	27.3	22.72
Year 3→	57	21	25.9	28.6	22.81

KBOR data minima for UG programs: ACT≤20 will trigger program.

b. For graduate programs, compare graduate GPAs of the majors with University graduate GPAs.*

Last 3 Years	Total Admitted - By FY		Average GPA (Admitted) – Domestic Students Only (60 hr GPA for those with ≥54 hr reported) By FY					
					Comparisons			
	MS	PhD	MS GPA	PhD GPA	College – MS	College – PhD	Univ - MS	Univ PhD
Year 1→08	19	10	3.71	3.83	3.44	3.75	3.48	3.62
Year 2→09	12	8	3.63	3.70	3.41	3.61	3.48	3.62
Year 3→10	17	4	3.52	3.82	3.32	3.67	3.48	3.67

*If your admission process uses another GPA calculation, revise table to suit program needs and enter your internally collected data.

c. Identify the principal learning outcomes (i.e., what skills does your Program expect students to graduate with). Provide aggregate data on how students are meeting those outcomes. Data should relate to the goals and objectives of the program as listed in 1e. Provide an analysis and evaluation of the data by learner outcome with proposed actions based on the results.

In the following table provide program level information. You may add an appendix to provide more explanation/details. Definitions:
Learning Outcomes: Learning outcomes are statements that describe what students are expected to know and be able to do by the time of graduation. These relate to the skills, knowledge, and behaviors that students acquire in their matriculation through the program (e.g., graduates will demonstrate advanced writing ability).
Assessment Tool: One or more tools to identify, collect, and prepare data to evaluate the achievement of learning outcomes (e.g., a writing project evaluated by a rubric).
Criterion/Target: Percentage of program students expected to achieve the desired outcome for demonstrating program effectiveness (e.g., 90% of the students will demonstrate satisfactory performance on a writing project).
Result: Actual achievement on each learning outcome measurement (e.g., 95%).
Analysis: Determines the extent to which learning outcomes are being achieved and leads to decisions and actions to improve the program. The analysis and evaluation should align with specific learning outcome and consider whether the measurement and/or criteria/target remain a valid indicator of the learning outcome as well as whether the learning outcomes need to be revised.

BS Math

Learning Outcomes:

"Students who complete our core courses will demonstrate competence in the computational skill taught in these courses as well as a familiarity with the underlying concepts of these courses."

In addition to the above learning outcomes, the department has created five goals that describe in detail what students are expected to know and be able to do by the time of graduation based on their career choices.

List of five goals

1. Students majoring in mathematics should possess a common core of mathematical skills, leading to a better understanding of mathematical reasoning.
2. Students who wish to do graduate work in mathematics should have an adequate understanding of Advanced Calculus and Ordinary Differential Equations.
3. Students who wish to do graduate work in engineering or one of the mathematical sciences, should have an adequate understanding of Calculus, Ordinary Differential Equations, and Numerical Methods.
4. Students who wish to teach mathematics should have an adequate understanding of Advanced Calculus, Ordinary Differential Equations, and Statistics.
5. Students who wish to pursue a career in business or industry should possess knowledge of diverse statistical techniques.

List of five core courses and their relations to goals assessed

- Math 415 Introduction to Advanced Mathematics — Goal 1
- Math 547 Advanced Calculus I — Goals 1, 2, 3, and 4
- Math 551 Numerical Methods — Goal 3
- Math 555 Differential Equations — Goals 2, 3, and 4
- Math 571 Statistical Methods I — Goals 4 and 5

Assessment Tool:

- Graded comprehensive final exams from all students in the core courses. These exams are constructed to include 2-3 problems selected from a list of problems prepared in advance by the department.
- Representative graded examples of student work on each tests given in the core courses.

In addition to being reviewed by department faculty, the above course materials are assessed annually (one or two core courses each year) by an external consultant from a prestigious university outside of Kansas. In particular in the past 9 years we have engaged distinguished external evaluators from Washington University in St. Louis, Brown University, Colorado State University, State University of New York at Albany, Kent State University, University of California at Berkeley, University of Waterloo, and New Jersey Science & Technology University.

After reviewing the above course materials, the consultant will:

- Produce a report addressing the overall course design and the student achievement on the courses under review.
- Judge the appropriateness of the course demand in relation to the goals set for students. This is done by assigning grade (A-F) in a questionnaire of three questions:
  1. Assuming all went as planned and the students diligently completed the syllabus, assign a grade to the syllabus indicating how well studying these topics would help students satisfy the objectives
  2. Now look at the tests given and grade them (as a single entity) according to how well achieving good scores on them would indicate that students have satisfied the objective.
  3. Finally, consider the graded examples of student work (again, as a single entity) and assign a grade indicating how well their performances demonstrate that students have satisfied the objective.

Target/Criteria:

Our criteria are built on consultant's grade on the questionnaires as well as consultant overall commends on student's performance and achievement on these courses.

Results:

Assessment results in the last four years:

Year	Course(s) assessed	Consultant's grade on the questionnaires	Consultant's comments on the courses
2008	Math 551	A, A, A	superior
2009	Math 572	A, A, A	superior
2010	Math 555	A, A, A	superior
2011	Math 415 & 547	A, A, A	superior

The assessment plans and assessment reports are included in Attachment #2.

BS Physics

Learning Outcome:

The study of Physics has 4 major areas:

Students majoring in physics should possess a common core of skills and knowledge, provided by the core classes in: Physics 621, Classical Mechanics; Physics 631, Electromagnetism; Physics 641, Thermodynamics; Physics 651, Quantum Mechanics; and Physics 516, 517, and 616, Advanced Laboratories. In addition, each student chooses elective specialty subjects of their own interest, for example, Solid State Physics, Nuclear Physics, or Astrophysics. Students choosing the double major with Engineering can fulfill this requirement with Engineering classes.

Proficiency is measured by the GRE Examination in Physics, taken by all graduating Physics majors.

Learning Outcomes (most programs will have multiple outcomes)	Assessment Tool (e.g., portfolios, rubrics, exams)	Target/Criteria (desired program level achievement)	Results	Analysis
Students acquire proficiency in physics	GRE Exam in Physics, taken by all Physics majors	Meet target:>50th percentile Exceed target:>70th percentile	FY09 100% meet; 100% exceed FY10 100% meet; 50% exceed FY11 100% meet; 100% exceed	performance is high enough to get students recruited by prestigious universities around the U.S.A

MS Mathematics

Learning Outcomes (most programs will have multiple outcomes)	Assessment Tool (e.g., portfolios, rubrics, exams)	Target/Criteria (desired program level achievement)	Results	Analysis
Students should acquire knowledge of mathematical and statistical theory and methods.	Grade point average. For each year 4 numbers are recorded: N:total # students enrolled Percent with gpa>=3.0; gpa>=3.5; gpa>=3.9 at the end of the semester	90% of students enrolled in program have gpa>=3.0; gpa>=3.5 and >=3.9 indicate higher levels of achievement.	FY09: N=25; >=3.0: 96%; >=3.5: 80%;>=3.9: 48%; FY10: N=21; >=3.0: 81%; >=3.5: 67%;>=3.9: 57%; FY11: N=31; >=3.0: 90%; >=3.5: 77%;>=3.9: 29%;	Target met in 2 of 3 years. Distibution of grades is acceptable.
Students should be able to solve graduate level mathematics and statistics problems.	Comprehensive Exam. Three examiners rate students on a scale of 1 to 5 (high) in 4 subjects	Two percentages are given: scores of 3 or above; scores of 5. Target: 3+: 95%	FY09:3+: 92%,5: 19% FY10:3+:100%,5: 50% FY11:3+:100%,5: 50%	Note: In FY09 one student failed on 1st attempt, but passed on 2nd. Both exams included.
Students should be able to communicate mathematical concepts in writing.	Comprehensive Exam. Three examiners rate students on a scale of 1 to 5 (high)	Two percentages are given: scores of 3 or above; scores of 5. Target: 3+: 95%+	FY09:3+: 88%,5:0.0% FY10:3+:100%,5:100% FY11:3+:100%,5: 75%	Target met in two of three years.
Students should be able to orally communicate mathematical concepts.	Comprehensive Exam. Three examiners rate students on a scale of 1 to 5 (high)	Two percentages are given: scores of 3 or above; scores of 5. Target: 3+: 95%+	FY09:3+: 88%,5: 17% FY10:3+:100%,5: 50% FY11:3+:100%,5:100%	Target met in two of three years.

PhD Applied Mathematics

Starting in Fall 2012, for those Learning Outcomes which are assessed by the Qualifying Exam, the Preliminary Exam or the Final Exam (Dissertation Defense), the faculty examiners will individually rate each student on a scale of 1 to 5. This will provide a metric which will indicate the level of student achievement for each Learning Outcome, which is not currently being provided. The template, similar to that given below for FY09- FY11, which will be used to report Learning Outcomes beginning in FY13 is available in the Appendix.

Learning Outcomes (most programs will have multiple outcomes)	Assessment Tool (e.g., portfolios, rubrics, exams)	Target/Criteria (desired program level achievement)	Results	Analysis
Students should master core subjects	Qualifying Exam	80% of those taking exam pass	FY 09 ½ pass FY10 2/3 pass FY11 8/8 pass	Three year rate , 85%, exceeds target
Students should master area of research specialization	Preliminary Exam	90% of those taking exam pass	FY09 2/2 pass FY10 2/2 pass FY11 2/2 pass	Target exceeded
Students should master some area of specialization and engage in current research	Progress in program	75% of students who pass Qualifying Exam should finish dissertation within 6 years	67% of students who passed Qual from FY01 to FY05 graduated within 6 years	One student left program soon after passing Qual. One did not make satisfactory progress.
Students should complete significant, publishable research	Dissertation Defense	100% of those defending pass	FY 09 1/1 pass FY10 3/3 pass FY11 2/2 pass	Target met
Students should complete significant, publishable research	Post graduation publication record	60% of doctoral graduates should publish the results of dissertation within 4 years	7/10 graduates from FY04 to FY11 published within 4 years	Target exceeded

d. Provide aggregate data on student majors satisfaction (e.g., exit surveys), capstone results, licensing or certification examination results, employer surveys or other such data that indicate student satisfaction with the program and whether students are learning the curriculum (for learner outcomes, data should relate to the goals and objectives of the program as listed in 1e).

Data below is for the MS program. No data is available for the other programs. For each of the questions on student satisfaction on the Graduate School Exit Survey two numbers are given below: the median, on a scale of 1-5, where 5 is highest; and the percent who are “satisfied or very satisfied”.

Student Satisfaction (e.g., exit survey data on overall program satisfaction).* If available, report by year, for the last 3 years			Learner Outcomes (e.g., capstone, licensing/certification exam pass-rates) by year, for the last three years				
Year	N	Result (e.g., 4.5 on scale of 1-5, where 5 highest)	Year	N	Name of Exam	Program Result	National Comparison±
5 year aver 07-11	48	Overall satisfaction (question 4): Mean: 4.38 “satisfied or very satisfied”: 88.9%					
5 year aver 07-11	48	Satisfaction with instruction in required courses (10) Mean: 4.45 “satisfied or very satisfied”: 91.5%					
5 year aver 07-11	48	Satisfaction with overall instruction (11) Mean: 4.51 “satisfied or very satisfied”: 93.6%					
5 year aver 07-11	48	Satisfaction with academic advising (20) Mean: 4.57 “satisfied or very satisfied”: 91.5%					
5 year aver 07-11	48	Satisfaction with thesis advising (25) Mean: 4.72 “satisfied or very satisfied”: 96.0%					

*Available for graduate programs from the Graduate School Exit Survey. Undergraduate programs should collect internally. ± If available.

e. Provide aggregate data on how the goals of the *WSU General Education Program* and *KBOR 2020 Foundation Skills* are assessed in undergraduate programs (optional for graduate programs).

The department currently assesses numerical literacy for those non-majors who complete Math 111. Students successfully satisfy this assessment by scoring at least 50% on the common core final for Math 111.

In order to also assess numerical literacy for non-majors at a more advanced level, the department has recently revised its assessment procedures to collect aggregate data on learner outcomes for non-majors completing the Differential Equations course. This includes all engineering students as well as many science majors. Differential Equations is the capstone course for most students completing the Calculus sequence.

Recent revisions to the assessment procedure will also provide assessment of both 'numerical literacy' and 'critical thinking and problem solving' for majors.

Data for the Math 111 assessment is provided in the table below. Data for the remaining assessments is not yet available.

Goals/Skills Measurements of: -Oral and written communication -Numerical literacy -Critical thinking and problem solving -Collaboration and teamwork -Library research skills -Diversity and globalization	Results	
	Majors	Non-Majors
Numerical literacy (lower level)		Percent meeting goal: AY09 62.5% AY10 60.2% AY11 66.4%
Numerical literacy (higher level)	NA	NA
Critical thinking and problem solving	NA	

Note: Not all programs evaluate every goal/skill. Programs may choose to use assessment rubrics for this purpose. Sample forms available at: http://www.aacu.org/value/rubrics/

f. Indicate whether the program is accredited by a specialty accrediting body including the next review date and concerns from the last review.

Provide information here: Not accredited.

g. Provide a brief assessment of the overall quality of the academic program using the data from 3a – 3f and other information you may collect, including outstanding student work (e.g., outstanding scholarship, inductions into honor organizations, publications, special awards, academic scholarships, student recruitment and retention).

Provide assessment here:
External evaluations of the undergraduate program in Mathematics have been uniformly positive. Copies of their letters are included in Attachment #2, as well as our Assessment plans (for Math/Stat programs). Learner outcome targets in the BS program in Physics, the MS program in Mathematics and the PhD program in Applied Mathematics have generally been met or exceeded.

Student satisfaction with the Master's program is very high. By way of comparison, the level of satisfaction with the instruction and advising in our program as reported in the Graduate Exit Survey, see table above, is uniformly higher than for the other programs in the Natural Sciences and Engineering.

Evidence of outstanding student work is provided by Everett Kropf who received the Dora Wallace Hodgson Outstanding Master's Thesis Award in 2009-10 and also the Dora Wallace Hodgson Outstanding Doctoral-Level Student Award in 2011.

4a. Analyze the student need and employer demand for the program. Complete for each program if appropriate (refer to instructions in the WSU Program Review document for more information on completing this section).

Utilize the table below to provide data that demonstrates student need and demand for the program.
Undergraduate – BS Mathematics

Majors						Employment of Majors*						
Last 3 FYs – Su, Fl, and Sp	No. new applicants or declared majors	No. who enter or are admitted in the major	No. enrolled one year later	1 Year Attrition %	Total no. of grads	Average Salary	Employment % In state	Employment % in the field	Employment: % related to the field	Employment: % outside the field	No. pursuing graduate or professional education	Projected growth from BLS**
Year 1→					6							Current year only ↓
Year 2→					3							
Year 3→					14							17%

Race/Ethnicity by Major***

	NRA	H	AI/AN	A	B	NH/PI	C	MR	UNK
Year 1→	1	3	1	5	2	0	22	0	3
Year 2→	3	2	2	2	4	0	30	0	2
Year 3→	7	1	2	4	2	0	38	0	3

Race/Ethnicity by Graduate***

	NRA	H	AI/AN	A	B	NH/PI	C	MR	UNK
Year 1→	0	0	0	0	1	0	5	0	0
Year 2→	1	0	0	0	1	0	1	0	0
Year 3→	0	1	0	1	0	0	11	0	1

* May not be collected every year
** Go to the U.S. Bureau of Labor Statistics Website: http://www.bls.gov/oco/ and view job outlook data and salary information (if the Program has information available from professional associations or alumni surveys, enter that data)
*** NRA=Non-resident alien; H=Hispanic; AI/AN=American Indian/ Alaskan Native; A=Asian; B=Black; NH/PI=Native Hawaiian/Pacific Islander; C=Caucasian; MR=Multi-race; UNK=Unknown
KBOR data minima for UG programs: Majors=25; Graduates=10; Faculty=3; KBOR data minima for master programs: Majors=20; Graduates=5; Faculty=3 additional; KBOR data minima for doctoral programs: Majors=5; Graduates=2; Faculty=2 additional.

Provide a brief assessment of student need and demand using the data from the table above. Include the most common types of positions, in terms of employment, graduates can expect to find.

Provide assessment here:

The number of graduates in years 1 and 2 are unusually low. The 5 year average for BS degrees in Math/Stat is 10.2 per year. Year 3 data indicates that the number of graduates has begun to increase again.

Our undergraduate majors find success in a broad variety of careers. A few years ago the Alumni Association generated the following information concerning employment of our graduates: Business (37%), Engineering (14.5%), Research and Academia (8.6%), Computing (16.5%), Statistics (4.6%), Education (7.6%) and Other (11.2%). In the "Other" category are included areas such as law, medicine, art, military, etc. Since there is no industry or business called "mathematics", outsiders often have the false impression that the only thing one can do with a degree in mathematics is to teach. Our undergraduate major is not only educated in advanced mathematical techniques, but in their course work they also get training in modeling, abstract reasoning and, of course, problem solving. This preparation is excellent for many professions.

4b. Analyze the student need and employer demand for the program. Complete for each program if appropriate (refer to instructions in the WSU Program Review document for more information on completing this section).

Utilize the table below to provide data that demonstrates student need and demand for the program.

Undergraduate – BS Physics

Majors						Employment of Majors*						
Last 3 FYs – Su, Fl, and Sp	No. new appli-cants or declared majors	No. who enter or are admit-ted in the major	No. enroll-ed one year later	1 Year Attri-tion %	Total no. of grads	Average Salary	Employ-ment % In state	Employment % in the field	Employment: % related to the field	Employment: % outside the field	No. pursuing graduate or profes-sional educa-tion	Projected growth from BLS**
Year 1→					2							Current year only ↓
Year 2→					2							
Year 3→					4							

	Race/Ethnicity by Major***									Race/Ethnicity by Graduate***								
	NRA	H	AI/AN	A	B	NH/PI	C	MR	UNK	NRA	H	AI/AN	A	B	NH/PI	C	MR	UNK
Year 1→	1	1	0	0	2	0	8	0	1	0	0	0	0	0	0	2	0	0
Year 2→	1	2	0	0	2	0	12	0	1	1	0	0	0	1	0	0	0	0
Year 3→	0	1	0	0	1	0	18	0	1	0	1	0	0	0	0	3	0	0

* May not be collected every year

** Go to the U.S. Bureau of Labor Statistics Website: http://www.bls.gov/oco/ and view job outlook data and salary information (if the Program has information available from professional associations or alumni surveys, enter that data)

*** NRA=Non-resident alien; H=Hispanic; AI/AN=American Indian/ Alaskan Native; A=Asian; B=Black; NH/PI=Native Hawaiian/Pacific Islander; C=Caucasian; MR=Multi-race; UNK=Unknown

KBOR data minima for UG programs: Majors=25; Graduates=10; Faculty=3; KBOR data minima for master programs: Majors=20; Graduates=5; Faculty=3 additional; KBOR data minima for doctoral programs: Majors=5; Graduates=2; Faculty=2 additional.

Provide a brief assessment of student need and demand using the data from the table above. Include the most common types of positions, in terms of employment, graduates can expect to find.

Provide assessment here:

Physics undergraduate majors find employment in a broad range of careers. Recent graduates have gone to graduate school in physics, mathematics, and engineering; to medical school; to teaching; and to employment in industry. Our students' wide fundamental knowledge and their training in modeling, abstract reasoning, and problem solving, often makes them the preferred candidates for leadership of diverse teams with backgrounds in engineering or in research projects having no known solution.

4c. Analyze the student need and employer demand for the program. Complete for each program if appropriate (refer to instructions in the WSU Program Review document for more information on completing this section).

Utilize the table below to provide data that demonstrates student need and demand for the program.
Graduate - MS

Majors						Employment of Majors*						
Last 3 FYs – Su, Fl, and Sp	No. new appli-cants or declared majors	No. who enter or are admit-ted in the major	No. enroll-ed one year later	1 Year Attri-tion %	Total no. of grads	Average Salary	Employ-ment % In state	Employment % in the field	Employment: % related to the field	Employment: % outside the field	No. pursuing graduate or profes-sional educa-tion	Projected growth from BLS**
Year 1→	26	11	6	45%	8		75%	88%	100%	0	5	Current year only ↓
Year 2→	15	7	4	43%	4		100%	100%	100%	0	4	
Year 3→	22	16	14	12.5%	10		100%	100%	100%	0	4	

	Race/Ethnicity by Major***									Race/Ethnicity by Graduate***								
	NRA	H	AI/AN	A	B	NH/PI	C	MR	UNK	NRA	H	AI/AN	A	B	NH/PI	C	MR	UNK
Year 1→	6	1	0	0	0	0	13	0	1	4	0	0	0	0	0	4	0	0
Year 2→	4	0	0	0	1	0	15	0	1	0	1	0	0	0	0	3	0	0
Year 3→	6	2	0	1	2	0	13	0	1	1	0	0	0	1	0	8	0	0

* May not be collected every year
** Go to the U.S. Bureau of Labor Statistics Website: http://www.bls.gov/oco/ and view job outlook data and salary information (if the Program has information available from professional associations or alumni surveys, enter that data)
*** NRA=Non-resident alien; H=Hispanic; AI/AN=American Indian/ Alaskan Native; A=Asian; B=Black; NH/PI=Native Hawaiian/Pacific Islander; C=Caucasian; MR=Multi-race; UNK=Unknown
KBOR data minima for UG programs: Majors=25; Graduates=10; Faculty=3; KBOR data minima for master programs: Majors=20; Graduates=5; Faculty=3 additional; KBOR data minima for doctoral programs: Majors=5; Graduates=2; Faculty=2 additional.

Provide a brief assessment of student need and demand using the data from the table above. Include the most common types of positions, in terms of employment, graduates can expect to find.

Provide assessment here:

For the sixteen years prior to 2008 graduates of the MS program fairly consistently fell into three groups of roughly the same size: one third obtained employment as teachers, one third obtained employment in business or industry and one third went on to doctoral study. Of those obtaining jobs in business and industry, about half were as statisticians, with most of the others either in computer related jobs (systems analyst, etc) or engineering related jobs--five at local aircraft companies.

The weaker economy since 2008 has altered the outlook for recent graduates. Data for the past three and a half years indicate that 18% of graduates have obtained employment in business and industry, 23% have obtained teaching jobs, and 59% have entered Ph.D. programs

4d. Analyze the student need and employer demand for the program. Complete for each program if appropriate (refer to instructions in the WSU Program Review document for more information on completing this section).

Utilize the table below to provide data that demonstrates student need and demand for the program.
Graduate – PhD

Majors						Employment of Majors*						
Last 3 FYs – Su, Fl, and Sp	No. new appli-cants or declared majors	No. who enter or are admit-ted in the major	No. enroll-ed one year later	1 Year Attri-tion %	Total no. of grads	Average Salary	Employ-ment % In state	Employment % in the field	Employment: % related to the field	Employment: % outside the field	No. pursuing graduate or profes-sional educa-tion	Projected growth from BLS**
Year 1→	7	6	3	50%	1		0.0%	100%	100%	0	0	Current year only ↓
Year 2→	11	6	6	0	3		67%	100%	100%	0	0	
Year 3→	7	4	2	50%	2		100%	100%	100%	0	0	

	Race/Ethnicity by Major***									Race/Ethnicity by Graduate***								
	NRA	H	AI/AN	A	B	NH/PI	C	MR	UNK	NRA	H	AI/AN	A	B	NH/PI	C	MR	UNK
Year 1→	7	0	0	0	0	0	8	0	0	1	0	0	0	0	0	0	0	0
Year 2→	7	0	0	0	0	0	9	0	0	1	0	0	0	0	0	2	0	0
Year 3→	6	0	0	0	0	0	9	0	0	2	0	0	0	0	0	0	0	0

* May not be collected every year

** Go to the U.S. Bureau of Labor Statistics Website: http://www.bls.gov/oco/ and view job outlook data and salary information (if the Program has information available from professional associations or alumni surveys, enter that data)

*** NRA=Non-resident alien; H=Hispanic; AI/AN=American Indian/ Alaskan Native; A=Asian; B=Black; NH/PI=Native Hawaiian/Pacific Islander; C=Caucasian; MR=Multi-race; UNK=Unknown

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Provide a brief assessment of student need and demand using the data from the table above. Include the most common types of positions, in terms of employment, graduates can expect to find.

Provide assessment here:

In our 2007 review it was reported that approximately 65% of the graduates of the program went into academic positions, while 35% obtained non-academic positions, either in business, industry or government . Of the nine graduates since that review, 78% went into teaching positions, perhaps a reflection of the changing economy. Student demand for the program has been greater in the past three years than in the previous six years: the average number of new students enrolled in the program each year over the three years reported here is twice the average number of new students enrolled in the program per year over the preceding 6 years. This may be due in part to poorer job prospects in a weak economy.

For the past three years somewhat less than half the students enrolled in the program are international students. The percentage of international students is lower now than ten or fifteen years ago. It is noted that the vast majority of international graduates of the program have obtained highly productive jobs in the U.S., either academic or non-academic, and many are now U.S. citizens.

5. Analyze the cost of the program and service the Program provides to the discipline, other programs at the University, and beyond. Complete for each program if appropriate (refer to instructions in the WSU Program Review document for more information on completing this section).

Percentage of SCH Taken By (last 3 years) - Mathematics			
Fall Semester	Year 1	Year 2	Year 3
UG Majors	2.4	2.5	3.7
Gr Majors	2.3	2.1	1.9
Non-Majors	95.3	95.4	94.4
Percentage of SCH Taken By (last 3 years) – Physics			
Fall Semester	Year 1	Year 2	Year 3
UG Majors	2.6	4.1	3.6
Gr Majors	0.0	0.0	0.0
Non-Majors	97.4	95.9	96.4

a. Provide a brief assessment of the cost and service the Program provides. Comment on percentage of SCH taken by majors and non-majors, nature of Program in terms of the service it provides to other University programs, faculty service to the institution, and beyond.

Provide assessment here:

By the design of our department, most of our SCH is produced by non-majors. This is (especially in the graduate programs) dictated by very limited funds (stipends, assistantships, etc.) to support our students. The Department of Mathematics, Statistics, and Physics is larger in student credit hours production than three WSU colleges (Education, Fine Arts, and Engineering). We however are the most inexpensive in terms of the expenditure of university resources. Since our production is on the level of colleges, we provide in Attachment #3 a comparison of our cost of producing one credit hour with that of all colleges in WSU. That worksheet (Attachment #3) shows that we are the most economical production unit.

6. Report on the Program's goal (s) from the last review. List the goal (s), data that may have been collected to support the goal, and the outcome. Complete for each program if appropriate (refer to instructions in the WSU Program Review document for more information on completing this section).

(For Last 3 FYs)	Goal (s)	Assessment Data Analyzed	Outcome
Review of Triggered Programs; Strategic Plan	Recruit 3 new students each year	Data reported above for FY10 and FY11, departmental data for FY12	FY10: 6; FY11: 4; FY12: 3
	Maintain minimum of 10 students in program each year	ditto	FY10: 16; FY11:15; FY12:14
	Graduate a minimum of 2 students each year	ditto	FY10: 3; FY11:2; FY12:2 or 3

Analysis:
Each goal has been met or exceeded. The department has satisfied the goals of the Strategic Plan for meeting KBOR graduation rate expectations, dated July 1, 2010. As of May 2012, there have been ten graduates in the 5 years ending in FY12 and the program should no longer be "triggered". Moreover, based on students currently in the program, we expect at least 2 or 3 graduates in each year through FY14, so the program should meet KBOR requirements for at least the next several years.

7. Summary and Recommendations

a. Set forth a summary of the report including an overview evaluating the strengths and concerns. List recommendations for improvement of each Program (for departments with multiple programs) that have resulted from this report (relate recommendations back to information provided in any of the categories and to the goals and objectives of the program as listed in 1e). Identify three year goal (s) for the Program to be accomplished in time for the next review.

Provide assessment here:

In terms of credit hours production our department is highly cost effective. As explained earlier we also are highly productive in publishing papers in refereed journals, applying for grants, etc.

To continue our highly regarded research productivity we need to maintain the faculty numbers we had in the previous decade. Generally, maintaining the size of a department preserves programs and overall stability. In addition, departments replace personnel when departures or retirements occur because it affords an opportunity to lower the average age of faculty in order to strengthen the department for the future.

To further increase efficiency and the productivity of our faculty and GTAs we need to continue being on the forefront of the computer revolution which is rapidly changing the way we teach and do research. The use of state-of–the-art technology already benefits us and our students tremendously. To continue utilizing the currently available technology we need to be aware of the latest developments in educational software. One critical need is more computer equipped classrooms. LAS provided us with one such facility years ago. It is being constantly used and provides us with obvious opportunities for computer use in teaching mathematics and statistics classes. However, it holds only 32 students at a time and at least one more such classroom is needed.

To continue the educational effectiveness in our graduate programs we have to constantly keep attracting talented students. At this time the stipends we have for our GTAs are not competitive with those at peer institutions; a serious increase in funding of these stipends is necessary.

DEPARTMENT OF MATHEMATICS, STATISTICS, AND PHYSICS

2012 SELF-STUDY REPORT

Attachment #1.

External reviews describing the professional quality of our faculty.

List of External Reviews

1. Research Services Group of Thomson Reuters	
2. Professor Gunther Uhlmann	University of Washington
3. Professor John D'Angelo	University of Illinois
4. Professor Nick Trefethen	Oxford University
5. Professor Rafe Mazzeo	Stanford University
6. Review for the Kansas NSF EPSCoR Award	
7. John E. Kolassa	Rutgers University
8. Robert Finn	Stanford University

SCI-BYTES - WHAT'S NEW IN RESEARCH : 2009

Week of May 31, 2009

< Back ¦ 2009 ¦ Home

U.S. Institutions with Highest Concentrations in Mathematics, 2003-07

Of U.S. institutions whose researchers published papers in Thomson Reuters-indexed mathematics journals between 2003 and 2007, those below contributed the highest percentages of their total papers to the field during that five-year period.

Rank	Institution	Number of math. papers, 2003-07	Percent of institution's total papers
1	Florida Institute of Technology	151	19.43
2	College of William and Mary	180	10.57
3	University of Memphis	167	10.26
4	DePaul University	60	7.81
5	Wichita State University	54	7.64

SOURCE: *University/Institutional Science Indicators*, 1981-2007. (Deluxe version contains complete listings of publication and citation statistics for U.S. universities/institutions in 105 subfields corresponding to subject areas covered in the seven editions of *Current Contents*®. Standard version features data covering 24 main fields. Both versions are available from the Research Services Group.)

< Back ¦ 2009 ¦ Home

back to top

UNIVERSITY OF WASHINGTON
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Department of Mathematics, Box 354350
C138 Padelford Hall

December 16, 2002

Dr. Robert Kindrick
Vice President, Academic Affairs and Research
109 Morrison Hall
Wichita State University
Wichita, KS 67260

Dear Dr. Kindrick:

This letter is in support of Professor Ziqi Sun's incentive review. I have known professor Sun for many years. He held a postdoctoral position at the University of Washington in 1987-1990. Moreover, we have collaborated in several papers which I consider among my best works.

During the last five years or so Sun has embarked in an ambitious project to understand inverse boundary problems for quasilinear anisotropic elliptic equations. This is a very important field arising in several applications. I thought, however, that this was an impossible project. I am well aware of the major difficulties that one would encounter in such a pursuit. In my own work with Sun we considered a particular case in which the coefficients of the quasilinear equation are independent of the gradient of the solution. This was already quite difficult. The level of difficulty of Sun's project represents a quantum jump over our joint work.

Sun and his student Hervas surprised everyone with his recent paper accepted in Communications in Partial Differential Equations. This is a very deep article which will be the subject of study of researchers in the field of inverse problems for several years to come. I found very striking the connection made between geometry and analysis which was made clear in a beautiful geometric Lemma proved by Sun in another recent article. These works are the product of several years of effort.

Sun is one of the best researchers working in the mathematical theory of inverse problems. He has chosen to work in some the most difficult problems in the area. He has proven significant results that displayed imagination and creativity and masterful command of techniques of partial differential equations and differential geometry. Major advances in Mathematics and other fields are often accomplished after sometime years of silent work. The recent articles of Sun represent such an advance. I very much hope that your University can find the resources to reward Sun for his recent accomplishments.

Sincerely,

Gunther Uhlmann
Professor of Mathematics

cc. Dr. Buma Fridman, Chairman Department of Mathematics and Statistics

UNIVERSITY OF ILLINOIS
AT URBANA-CHAMPAIGN

Department of Mathematics
273 Altgeld Hall, MC-382
1409 West Green Street
Urbana, IL 61801

August 12, 2003

William D. Bischoff, Dean
Fairmount College of Liberal Arts and Sciences
Wichita State University
Wichita, Kansas 67260-0005

Dean Dean Bischoff:

Thank you for asking me to review the scholarship of Dr. Daowei Ma.

Ma is an excellent and original geometer. Most of his papers deal with geometric issues arising in function theory in several complex variables. Recently he has also published several joint papers of a more applied nature, and I am not knowledgeable to comment on these applied papers.

Perhaps Ma's most impressive paper in recent years is paper (30) from his publication list. Earlier many authors had noted some version of what seemed to be a basic principle in geometry. Small changes can destroy symmetry, but cannot create symmetry. Greene and Krantz, for example, had formulated this idea precisely, and had proved an upper semicontinuity result for automorphism groups of strongly pseudoconvex domains around 1985. A flurry of activity occurred in this area. In 1994, Fridman and Poletsky showed that the principle failed as stated. Their result holds for any bounded domain. Small changes can indeed create symmetries. In (30), however, Ma joined Fridman and Poletsky and the three authors provided a decisive explanation. The principle needed a reformulation, they provided it, and this reformulated principle works. They showed that the dimension of the automorphism group does depend upper semicontinuously on parameters, and it follows that a domain cannot be approximated by a sequence of domains for which the automorphism group has larger dimension. This paper appeared in the American Journal of Math, one of the top journals. The techniques are a beautiful blend of complex analysis and differential geometry. In particular the Caratheodory extremal mappings arise.

Ma has used these extremal mappings in several papers. His 1991 paper (number 10) in the Duke Math Journal, also a top journal, used these mappings as part of a systematic study of estimates for invariant metrics (including the Kobayashi and Caratheodory metrics) on strongly pseudoconvex domains. The results in (10) improve and generalize a well known result of I. Graham. Perhaps (10) is Ma's best early paper.Since then (1997) he (21) had studied these extremal mappings for complex ellipsoids. In (17) he proved a smoothness result for the Kobayashi metric on ellipsoids, and in (16) he studied estimates for the Cauchy-Riemann operator on ellipsoids. (This paper appeared in the strong journal Communications in PDE.) Papers (12) and (13) also involve ellipsoids.I think, of all people who have ever studied complex ellipsoids, Ma's work is the most broad. It reveals his command of analytic methods as well as the geometric methods mentioned above.

Looking at his publication list it seems that Ma's activity waned a bit in the late 1990's, but it has certainly revived since. In the last four years he has published ten papers, three of them in applied math, and the other seven in geometric complex function theory. He even got involved in joint work with Kim on infinite dimensional complex analysis; they characterized the unit ball in a Hilbert space via automorphism groups.

Ma has made several significant contributions to geometric complex analysis. He has published many good papers in good journals. Although many of Ma's papers are joint, he is certainly an independent scholar; his imaginative geometric insights surely play a big role in these joint papers.

Sincerely yours,

John P. D'Angelo
Professor of Mathematics

-----Original Message-----
From: Nick Trefethen [mailto:LNT@comlab.ox.ac.uk]
Sent: Monday, August 23, 2004 10:48 AM
To: cheryl.miller@wichita.edu
Cc: lnt
Subject: Thomas DeLillo

William D. Bischoff, Dean
Fairmount College of Liberal Arts and Sciences
Wichita State University
Wichita, KS 67260-0005

Dear Dean Bischoff,

You have asked me to review the scholarship of Prof. Thomas Delillo, currently Associate Professor in the Dept. of Mathematics and Statistics. I hope this letter will be helpful. Your request comes during my travels on sabbatical, and I hope it will not be a problem that it is sent by email rather than on Oxford letterhead.

I have known Prof. DeLillo since he was a graduate student at New York University in the 1980s, when I was a post-doc there. We had a common interest in the subject of numerical conformal mapping, and this remains the area in which DeLillo has made most of his contributions and is best known. Numerical conformal mapping is a rather small subject, in which it is not hard to list most of the main players of the past few decades: Henrici, Gaier, Opfer, Gutknecht, Wegmann, Fornberg, Marshall, Driscoll, Reichel, Papamichael, Stylianopoulos, Elcrat, Berrut, Trummer, Floryan, Davis, Pfaltzgraff, myself, and DeLillo... that list is a pretty good approximation already. In this area DeLillo is certainly well known and well regarded for his contributions to Schwarz-Christoffel mapping, Wegmann- and Fornberg-type methods, multiply-connected domains, development of inequalities and other estimates, and applications. He is a "player" in this field, and when mathematical scientists in later decades consider what was done with conformal mapping in the half-century after the invention of computers, DeLillo's name will be among those that will be part of the answer.

I was particularly impressed with DeLillo's recent papers on doubly- and multiply-connected Schwarz-Christoffel formulas, joint work with Elcrat and Pfaltzgraff, the second paper not yet in print. This seems a significant advance on a fundamental problem that has been with us since about 1870.

From his base in conformal mapping DeLillo has turned also to other related topics, notably inverse problems and associated problems of convergence of matrix iterations such as conjugate gradients. As far as I can tell he has made worthwhile contributions in these areas. Here as in conformal mapping, the number of his publications is not especially large for somebody at his stage of a career, but the journals involved are for the most part the leading ones. Similarly on other measures of academic activity such as editorial work and involvement in conferences DeLillo does not appear as internationally outstanding, but as solid and active in his field. Certainly I value him as a colleague.

Yours sincerely,

Lloyd N. Trefethen
Professor of Numerical Analysis, Oxford University

--

L. N. Trefethen
Professor of Numerical Analysis and
Fellow of Balliol College, Oxford University

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Department of Mathematics
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mazzeo@math.stanford.edu

September 2, 2004

Dean William Bischoff
Office of the Dean
Fairmount College of Liberal
Arts and Sciences
Wichita State University
Wichita, Kansas 67260-0005

Dear Dean Bischoff,

I am writing in response to your solicitation, earlier this summer, for my evaluation of the scholarship of Prof. Zhiren Jin, an Associate Professor in the Department of Mathematics at Wichita State. I understand that this evaluation is to be used in the current case for promoting him to the position of Professor in this department.

Dr. Jin's research is in the area of partial differential equations; this is a vast area in mathematics with many contacts to other sciences. Jin's particular specialty concerns semilinear and quasilinear elliptic equations, which again has many important applications, both in mathematics and elsewhere. In his career he has been quite productive and has written a significant number of important and difficult papers. He has without doubt established himself as a real authority in this field.

You ask me to comment on various aspects of his work, specifically its originality, significance, level of activity and appropriateness of journals in which he has published.

Jin's earliest work is quite closely tied to geometry, as is natural given the predilections of his advisor. He began to make significant contributions very early, amongst which I should point out his paper [3], which stimulated a fair amount of work by other researchers. He moved on and began to work on problems concerning solutions of more general semilinear, and later, quasilinear, elliptic equations. This class of equations is really fundamental in the field and so any new progress here is likely to have real significance. Some of this work has been done in a long and fruitful collaboration with Kirk Lancaster, but much has been done on his own too. Looking carefully at these papers, I feel that Jin exhibits technical mastery in a very difficult subject, and it is nice to see how the scope of his interests continues to widen. He has definitely displayed independence and originality in his work.

To be even more specific, much of Jin's work in the mid to late '90's concerns pushing the limits on the applicability of various comparison theorems for broad classes of quasilinear elliptic equations on noncompact domains. While formulated purely analytically, these results apply to a lot of very important and well studied problems in geometry, including the prescribed mean curvature equation, the capillarity equation, etc. Closely related to these ideas are estimates for solutions of such equations at infinity. He has kept on pushing on these difficult problems and I think his papers with Lancaster, [17], [19], [21], [26], are particularly incisive. More recently he has been working somewhat different questions related to solvability; I think [23] is particularly interesting.

He has published in a range of very reputable journals; I should point out that his papers [19], [20] appeared in a journal for which I am the managing editor and I encouraged their submission to this journal and was happy to have them appear there. His rate of production has been on the average quite good, and it is clear to me that he will continue with his record of contributing very sound scholarship.

Altogether, my opinion is that the work of Zhiren Jin is very solid, and his record definitely exhibits all the qualities you are looking for. I also look very favourably on his extended collaboration with Lancaster; the fact that these two are in the same department and able to interact so well together is a real plus.

Sincerely,

Rafe Mazzeo

Rafe Mazzeo
Professor of Mathematics

R2

CONFIDENTIAL

Kansas NSF EPSCoR

First Award Review – Due January 10, 2005

Name of Principal Investigator: Thalia D. Jeffres
Title of Proposal: Special Metrics and PDE's on Singular Manifolds

Instructions: Before writing your review, please read: 1) NSF Merit Review Criteria, and 2) the Kansas NSF EPSCoR *Request for Proposals*.

Following each criterion below are potential considerations that you may employ in the evaluation. These are suggestions and not all will apply to any given proposal. Please address only those considerations that are relevant to the proposal and for which you feel qualified to make judgments. In responding to Criterion 2, please place special emphasis on the likelihood that the proposed S&T infrastructure improvements "will result in lasting improvements to the state's STEM research and educational infrastructure and thereby, increased national R&D competitiveness" (NSF 04-564).

After providing a qualitative judgment of the proposal's merits against the criteria, please make quantitative judgments in Section 3.

Then, in Section 4, please provide suggestions that will help improve this proposal. For example, are there specific suggestions that will help this investigator become competitive for federal funds? Is the trajectory of the research appropriate and well thought-out relative to the discipline? Is the education and human resources component well thought-out? Are there well-developed procedures to implement the project plan? These are suggestions and not all will apply to any given proposal.

Criterion 2: What are the broader impacts of the proposed activity?

- How well does the activity advance discovery and understanding while promoting teaching, training, and learning?
- How well does the proposed activity broaden the participation of underrepresented groups?
- To what extent will it enhance the infrastructure for research and education, such as facilities, instrumentation, networks, and partnerships?
- Will the results be disseminated broadly to enhance scientific and technological understanding?
- Does this proposal contain research in an area that is a priority to Kansas? (Priority will be given to proposals for research in biology, chemistry, physics, geology, mathematics, computer science and engineering. However, proposals in the area of **Living Systems** will receive priority for First Award funding. **Living Systems** includes research related to environmental quality, the basic biological sciences, biochemistry, bioengineering, biophysics, biotechnology, and bioinformatics.)
- How likely is it that a First Award will significantly improve the PI's ability to become competitive and develop a self-sustaining research program? How likely is it that the proposed research will have an impact on economic development in Kansas in the next five to ten years?

The broader impacts of the proposed activity are well documented. Jeffres worked in Mexico before moving to Kansas, and has mentored several students there. As she points out, this experience should make her more effective training students from different cultures. The proposal indicates a commitment to training students, including under-represented groups, at the High School level.

She brings to a heavily application-oriented department a more modern component. In the twentieth century, powerful ideas such as coordinate-invariance, local exploitation of symmetry, and global
topology of abstract spaces led to foundational breakthroughs in our understanding in the twentieth century. These advances have fundamentally impacted even the most application-oriented mathematics.

R3

CONFIDENTIAL

Kansas NSF EPSCoR

First Award Review – Due January 10, 2005

Name of Principal Investigator: Thalia Jeffres

Title of Proposal: Special Metrics and Differential Equations on Singular Spaces

Instructions: Before writing your review, please read: 1) NSF Merit Review Criteria, and 2) the Kansas NSF EPSCoR *Request for Proposals*.

Following each criterion below are potential considerations that you may employ in the evaluation. These are suggestions and not all will apply to any given proposal. Please address only those considerations that are relevant to the proposal and for which you feel qualified to make judgments. In responding to Criterion 2, please place special emphasis on the likelihood that the proposed S&T infrastructure improvements "will result in lasting improvements to the state's STEM research and educational infrastructure and thereby, increased national R&D competitiveness" (NSF 04-564).

After providing a qualitative judgment of the proposal's merits against the criteria, please make quantitative judgments in Section 3.

Then, in Section 4, please provide suggestions that will help improve this proposal. For example, are there specific suggestions that will help this investigator become competitive for federal funds? Is the trajectory of the research appropriate and well thought-out relative to the discipline? Is the education and human resources component well thought-out? Are there well-developed procedures to implement the project plan? These are suggestions and not all will apply to any given proposal.

Criterion 2: What are the broader impacts of the proposed activity?

- How well does the activity advance discovery and understanding while promoting teaching, training, and learning?
- How well does the proposed activity broaden the participation of underrepresented groups?
- To what extent will it enhance the infrastructure for research and education, such as facilities, instrumentation, networks, and partnerships?
- Will the results be disseminated broadly to enhance scientific and technological understanding?
- Does this proposal contain research in an area that is a priority to Kansas? (Priority will be given to proposals for research in biology, chemistry, physics, geology, mathematics, computer science and engineering. However, proposals in the area of **Living Systems** will receive priority for First Award funding. **Living Systems** includes research related to environmental quality, the basic biological sciences, biochemistry, bioengineering, biophysics, biotechnology, and bioinformatics.)
- How likely is it that a First Award will significantly improve the PI's ability to become competitive and develop a self-sustaining research program?
- How likely is it that the proposed research will have an impact on economic development in Kansas in the next five to ten years?

I have seen the proposer lecture in professional seminars (e.g. Rutgers University). Her style is clear and informative. I have no doubt that she will attract and motivate young people interested in mathematics. Clearly, the proposer's experience as a faculty member in Mexico will be a unique advantage. Her knowledge of Spanish will be useful in attracting Latin-American students in the area.

She has already begun projects with two collaborators at least (Loya and Mazzeo). This should attract mathematicians to the growing department at Wichita.

The work proposed here is of a world class nature. It should be published in significant research journals. Jeffres's record already shows this.

A first award will give the project a significant boost. Travel funds are probably the most significant item here. The proposer (like all serious researchers) needs to meet with collaborators and attend conferences. It is very difficult to do this kind of work in isolation.

THE STATE UNIVERSITY OF NEW JERSEY
RUTGERS

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1 Aug 2008

Dean William D. Bischoff
Fairmount College of Liberal Arts
Wichita State University
Wichita, Kansas 67260-0005

Dear Dean Bischoff,

This letter is in response to your request for an evaluation of Chunsheng Ma's research record, to be used to determine whether he will be promoted to professor.

Dr. Ma's record of publication reveals that he is a very productive researcher, both in terms of volume and quality of work. His work has appeared in a variety of statistical and other journals; thise range from top-tier journals to middle-tier journals. This record compares favorably with other scholars receiving promotion to the rank of professor at major research universities.

The large number of successful research projects listing Dr. Ma as the sole author indicate that he is clearly established as an independent scholar. His published articles represent a contribution to the field of statistics typical for a senior academic. He is certainly appropriately active in our field. Since most of his sole--author research relates to time series, and I don't know the time series literature, I must trust the judgement of the journal referees when attesting to its originality.

I will illustrate the importance of Dr. Ma's work by commenting on two of his manuscripts involving multivariate survival functions (Metrika, 1998, and Journal of Multivariate Analysis, 2000). I choose these not because they are Dr. Ma's best papers, but because they are the ones that I feel most excited about reading. Survival analysis involves the study of times until an event occurs; these models are routinely used to describe the superiority of one treatment over another treatment at delaying patient death. Trying to account for multiple types of events simultaneously (for example, time until consecuitive recurrences of a disease, or time until two family members die) is much more difficult than accounting for times until events separately, since generally we assume that these event times are dependent, and typically univariate survival models do not have natural correlated extensions, as do, say, univariate normal models. The Metrika paper investigates the logical conclusions of some assumptions about multivariate survival models, and the Journal of Multivariate Analysis paper introduces a new class of survival models. This work is very important, and is likely to have a large impact.

Dr. Ma has an admirable research record for a university faculty member being considered for promotion to professor; this record displays all of the requirements listed in your letter of 20 June. I note that your letter explicitly requests that I do not make a recommendation for or against promition. The lack of such a statement in my letter should not be interpreted as a reticence on my part.

Sincerely,

John E. Kolassa
Professor and Graduate Program Director
Statistics and Biostatistics
Rutgers University

STANFORD UNIVERSITY
STANFORD, CALIFORNIA 94305-2125

DEPARTMENT OF MATHEMATICS
Robert Finn (650) 723-2605, FAX 725-4066
finn@math.stanford.edu

August 9, 2010

Buma Fridman, Chairperson
Department of Mathematics and Statistics
Wichita State University
1845 Fairmount St.
Wichita, Kansas 67260-0033

Dear Professor Fridman,

Kirk Lancaster transmitted to me your request for evaluation of his scientific contributions.

I've had contacts with Kirk over many years, and I've refereed some of his papers. There has been no occasion in which I was not impressed by the quality and originality of the new contribution. I did once or twice have to request rewriting for clearer exposition.

I've come now to view Kirk as an outstanding mathematician of world stature. He has proved deep and beautiful theorems, some of which will certainly become building blocks for major developments of the future, and I expect his scientific influence will be felt long after all of us are gone. His methods have been original and ingenious, requiring active working conversance with subtle points of modern theory, and displaying strikingly deep insight and comprehension. He has suffered for being a "non-smooth" expositor whose papers tend to focus on technical detail and can be difficult to read. When I look at some of his papers, the pervading thought that comes to mind is that he tacitly assumed the reader to share his detailed familiarity with fine points of modern theory.

Kirk has produced a considerable range of original work; I'll focus here on things that have major meaning for me. The paper that first put his unusual talents into perspective for me was his spectacular joint work with David Siegel in the Pacific Journal **176** (1996) 165—194; **179** (1997) 397-402. Using very original methods in conjunction with boundary regularity estimates due to E. Heinz, those authors established quite remarkable and certainly unexpected restrictions in kinds of behavior of a capillary surface at a re-entrant corner. Specifically they demonstrated the presence of "fan domains" attaching to the corner, in which the radial limits of the surface height are constant in angle of approach. They showed also that in some cases a "central fan" of angular width π can appear. As corollary of the method, they obtained a very elegant proof of continuity of solutions of "$\mathcal{R}$-type" at a protruding corner. This result had first been shown by Leon Simon, based on delicate reasoning from geometrical analysis, in the special case of constant data and under some restrictions; the restrictions were later removed by Luen-Fai Tam, using similar methods. The L&S proof gives a best possible result for general data, in a clear conceptual context and under no restrictions.

The problem was taken up later by Danzhu Shi in an impressive work that appeared in a special volume on capillarity of the Pacific Journal (vol. 224, 2006). Shi gave the first formal characterization of conditions determining the individual kinds of behavior at a re-entrant corner. Her results had a sense of being "right", however they were based on validity of a conjecture Paul Concus and I had made about 1970, on discontinuity of certain solutions in protruding corners. Sophisticated computer calculations had supported the conjecture (just barely!), however attempts by a number of people (myself included) to prove it had led to naught.

Several months ago I accepted Kirk's proof of the conjecture for publication in the Pacific Journal, and it should appear shortly. I was very uneasy about this paper, as it is long and hard, and embraces a number of individually delicate steps, each requiring difficult and delicate techniques. I found a tough referee who took a long time and produced challenging questions on sensitive points, but Kirk was able to hold his ground. This paper effectively closes a remarkable chapter of a basically new theory with striking and deep results that have no parallel in classical theory in my experience. I think there may also be important applications of Kirk's discoveries, on matters such as insulating coatings on computer chips with rectangular sections.

I have no idea as to the context in which Kirk's request to me arose. The papers I have indicated are on topics of direct interest for me, and my experience with the problems has I think given me some perspective as to their difficulty and their continuing importance. I am convinced that Kirk's contributions have a permanence in the scientific scheme of things that very few professional mathematicians can match.

Sincerely,

R Finn

Robert Finn

DEPARTMENT OF MATHEMATICS, STATISTICS, AND PHYSICS

2012 SELF-STUDY REPORT

Attachment #2 (A)

Assessment plans and results
Undergraduate Programs

Table of contents

Pages

Physics Undergraduate Assessment plan and reports 43-50

Math/Stat Undergraduate Assessment plans 51-56

Math/Stat Assessment Reports (2008-2011) 57-67

Prof. Lothar Reichel, Kent State University
Prof. Ching-Shui Cheng, University of California, Berkeley
Prof. Larry Cummings, University of Waterloo, Canada
Prof. Dennis Blackmore, New Jersey's Science & Technology University

Physics Department* Undergraduate Assessment Plan

University Mission

Wichita State University is committed to providing comprehensive educational opportunities in an urban setting. Through teaching, scholarship, and public service, the University seeks to equip both students and the larger community with the educational and cultural tools they need to thrive in a complex world, and to achieve both individual responsibility in their own lives and effective citizenship in the local, national, and global community.

High quality teaching and learning are fundamental goals in all undergraduate, graduate, and continuing education programs. Building on a strong tradition in the arts and science, the University offers programs in business, education, engineering, fine arts, and health professions, as well as in the liberal arts and sciences. Wichita State has 113 degree programs that range from the associate to the doctoral level; non-degree programs are designed to meet the specialized educational and training needs of individuals and organizations in south central Kansas.

Scholarship, including research, creative activity, and artistic performance, is designed to advance the University's goals of providing high quality instruction, making original contributions to knowledge and human understanding, and serving as an agent of community service. This activity is a basic expectation of all faculty members at Wichita State University.

Public and community service activities seek to foster the cultural, economic, and social development of a diverse metropolitan community and of the state of Kansas. The University's service constituency includes artistic and cultural agencies, business and industry, and community educational, governmental, health, and labor organizations. Wichita State University pursues its mission utilizing the human diversity of Wichita, the state's largest metropolitan community, and its many cultural, economic, and social resources. The University faculty and professional staff are committed to the highest ideals of teaching, scholarship, and public service, as the University strives to be a comprehensive, metropolitan university of national stature.

Program Mission

The mission of Wichita State University is not merely that of a trade school, but to provide "comprehensive" education. A good university education teaches students to think critically, and to use the wisdom of the past to understand the present and to develop a vision for the future. Physics is an essential part of this goal. Physics can be defined as the attempt to understand the behavior of matter and energy in terms of a few general laws or principles. Physicists try to understand the cosmos, all the way from stars and galaxies down to the elementary particles that make up nuclei and atoms. The laws

* In 2008, 2009 and 2010 there was an independent department of Physics.

of physics underlie the electronic intricacies of computers as well as the biological complexities of the human brain. Understanding the cosmos and the human brain are perhaps the boldest goals of 21st century physics, but of course there are also more down-to-earth problems being tackled by physicists today. In fact, the creative processes used in physics – the logic, the discipline, the approach to analyzing the single tree without being overwhelmed by the forest – also have important applications in many other areas if not in all.

Physics is the fundamental science and forms the core of every discipline in one way or another. The physics department provides the following service courses to the general education program of the university and for the science, health professions, and engineering majors: Physics 111, 131, 195, 213, 214, 313, 314, 315, 316, 320, and 395.

For Physics majors we offer two Bachelor's degrees, the BA and the BS. In addition to the basic courses which are a part of every physics major's preparation, we take pride in offering our students unique opportunities to be involved in fundamental original research as a significant part of their degrees. Physics degrees from WSU prepare our students with the tools necessary either to carry on their education in graduate studies or to seek careers in industry, government service or education. WSU Physics graduates are currently well employed in industry as engineers, in software development companies, and in the teaching profession as educators.

As part of the University's goal of making original contributions to knowledge and human understanding, the Physics Department faculty are expected to have nationally competitive research programs, seek external funding, and attend national and international conferences.

The department as a significant part of the metropolitan advantage takes pride in serving the community and region via public education activities such as presentations and speeches. Lake Afton Public Observatory and the Fairmount Center of Science and Mathematics Education were both started and nurtured in our department. Every year our faculty members play a disproportionately large role in Science Olympiad and the Kansas Junior Academy of Science, and we are proud to do so. More recently we have been collaborating significantly with the College of Education as well.

Program Goals and Objectives

1. To provide high quality introductory physics courses for other program's majors, and for WSU's general education program.
2. To provide high quality instruction, a solid undergraduate program, and research mentoring for physics majors.
3. To produce high quality fundamental physics research, as measured by published articles and books, presentations, and external funding; involvement in current areas of physics and collaborations with researchers in other fields and at other institutions; and national and international recognition.
4. To engage in educational outreach.

Learner Outcomes

Students who have taken introductory physics courses from WSU should be a) well prepared for the next course, if taking another physics course; b) well-prepared in the physics background they need to succeed in their chosen major, if not taking another physics course; and c) well-grounded in the basic understanding that physics provides of the universe as a whole. Students graduating with a physics degree from WSU should be well-prepared for graduate school, professional school, or for entering the work force, based on their knowledge of physics and their technical skills in problem solving, modeling, computers, and electronics.

Assessment of Program Goals

1. Scientific productivity: number of articles, quality of articles, number of presentations, quality of venues, number of citations, quality of citations.
2. Number of external and internal grants and dollar amount of grants.
3. Number and breadth of collaborations, number and quality of external invitations for talks, panel service, grant refereeing, paper refereeing.
4. Number, size, and quality of educational outreach activities.

Assessment of Learner Outcomes

Introductory Courses:
The Physics Department plans to integrate its assessment plan into the fabric of our larger goals as a department. We are primarily a service department: Most of our credit hours, and a majority of our faculty's time, is spent in teaching majors from other departments. Our work is none the less vital for that fact, however. Instruction in physics is fundamental for all of engineering, physical and life sciences. Accrediting agencies from ABET to ACS all require that students learn the basics, which in most cases requires a year of introductory physics at either the algebra or the calculus level. The Physics Department therefore offers Physics 213-214 and Physics 313-314-315-316 for the two respective levels. Each sequence is a total of 10 credit hours, including labs. The first semester (213 or 313-315) covers classical mechanics, heat, and wave motion; the second (214 or 314-316) covers electricity, magnetism, and light. In addition, 214 covers the small amount of modern physics that life sciences students need (especially to pass the MCAT.)

One of the major problems we (like most physics departments) face is a very high dropout rate in these basic courses. We have tried to address this problem in two ways: we have created a second-half-of-the-semester course, Physics 151, for students who find that their preparation is less than adequate; and we have instituted a Physics Help Lab (at the moment inadequately staffed by volunteers) to assist students having trouble. Unfortunately both are underutilized. Professors estimate that something like a third of the students enrolling in 213 or 313 (amounting to dozens in total) are underprepared, but enrollment in 151 this semester was only 3. Many are probably deciding to take the easier course at a community college, which experience teaches will probably only set them up for failure in the next course. But even if they did all enroll in 151 after dropping out of 213 or 313, it would be much better if we could direct him/her to the correct course in the first place.

We therefore propose that we set up a system similar to that the Mathematics Department has followed for years: a placement examination to determine the readiness of students for entering 213 or 313, and an exit exam for each course which can also serve as a placement exam for 214 or 314. Students demonstrating insufficient preparation for 213 or 313 could be directed to take the preparatory problem-solving course, 151, or the conceptual physics course, 111. Students with low but passing scores would be forewarned that their preparation was somewhat weak, and would know ahead of time to expect to have to work harder or to need Help Lab assistance.

In addition to going a long way towards solving our dropout problem, these exams can also serve the purpose of assessment – of the bulk, if not the whole, of our program. Collecting the data over only a couple of semesters will give us respectable numbers, enough for reliable statistics. One suggestion has been to use a nationally available, and normed, qualitative test (like Force Concept Inventory) for the conceptual physics part of the placement exam; this would have the advantage that we could then compare our results with those from physics departments across the country. In addition, by comparing averages for exit exams of large sections taught by different methods we could also objectively evaluate those methods' efficacy.

A committee of four faculty members (Drs. Axmann, Behrman (chair), Ferguson (undergraduate coordinator), and Foster) has been set up to construct the five examinations (placement, 213 exit, 313 exit, 214 exit, and 314 exit.) We hope to have these worked out and ready for Fall Semester, 2005. For Spring Semester 2005 we will gather preliminary data using the Force Concept Inventory as pre- and post-test for 111, and as pre-test for both 213 and 313 classes; for post-tests we plan to use (part of) the AP Physics tests at the appropriate levels.

Upper Division Courses:

The major as a whole also needs to be objectively evaluated. The major difficulty here is that we have so few majors – only a handful graduate every year – that it will take many years before statistics of any worth can be generated. However that is no reason not to start. We propose that graduating seniors take the Graduate Record Exam in Physics. This is a well-known, respected, and nationally normed examination that covers the entire undergraduate physics curriculum. There are parts of the exam that cover subjects a small department like ours cannot teach, like elementary particles or general relativity; however, these sections are small and in analyzing the results we can make allowances for these omissions.

Unfortunately this exam does cost almost $200 to take, and this may well be an expense many who were not planning on going to graduate school immediately cannot afford. If we cannot find the money to cover this for our students we can construct a number of similar exams from preparation books, and administer it ourselves.

Results

See the following tables for 2008, 2009 and 2010.

Feedback Loop

Since this process is new to us, we have not yet finalized either the assessment instrument or its method or standards of analysis. For the coming semester we will administer, as both pre- and post-test for 111, and as pre-test for the 200 and 300 level, the Force Concept Inventory. Our committee will construct preliminary versions of the post-tests for the 200- and 300-level courses from AP Physics tests. In May of 2005 we will meet as a faculty to discuss the results. Our analysis will provide important data for the committee of four, which will have been working on the design of the five examinations and the databases we will need for their administration. It will also, we hope, provide us with important information about how we can better teach our courses.[1]

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1 [1]Hake, R. R. (1998). Interactive-engagement versus traditional methods: A six-thousand-student survey of mechanics test data for introductory physics courses. American Journal of Physics, 66, 64-74.

Can be accessed from:
http://scitation.aip.org/dbt/dbt.jsp?KEY=AJPIAS&Volume=66&Issue=1

Assessment results 2008:

Department of ___Physics___________________________

Program-initiated Goal of Objective	Where, When, and How Monitored	Expectation for Satisfactory Performance	Decision Point	Observations of Student Performance	When and By Whom Were Results Analyzed?	Outcome of Analysis	Dept. or Program Follow-up
Physics 111 students will demonstrate significant learning of conceptual physics	***Pre- and post-testing using Force Concept Inventory***	***Performance on nationally normed exam***	***Each student demonstrates a gain g = (posttest-pretest)/(100-pretest) of at least 0.3 and/or final performance of 60% or better.***	_How many students _9 students exceeded _15 meet and _3 did not meet expectations _6 students exempted _33 Total	Dept. meeting date __ or Individual analysis (describe)? Based on previous report	Objective not wholly satisfied. Follow-up strategy is to introduce interactive engagement methods in 111 course	None required □ Follow-up completion on date __________ xWill re-examine by date end of fall semester and each semester thereafter
Physics 213 students will demonstrate significant learning of algebra-level mechanics, heat, and waves	***AP level B Physics exam (half of it)***	***Performance on nationally normed exam***	***Each student scores at least 40%, and students earning an A score at least 60%***	_How many students _24_ exceeded _66_met _45_did not meet expectations? _11_exempted _146_Total	Dept. meeting date ___ or Individual analysis (describe)? Based on previous report	Objective not wholly satisfied. Follow-up strategy is to introduce interactive engagement methods, to introduce a math placement test , and to begin to standardize curricula	None required □ Follow-up completion on date __________ xWill re-examine by end of fall semester and each semester thereafter
Physics 214 students will demonstrate significant learning of algebra-level electricity, magetism, llight, and modern physics	***AP level B Physics exam (the other half of it)***	***Performance on nationally normed exam***	***Each student scores at least 40%, and students earning an A score at least 60%***	How many students _16_ exceeded _37_met _16_did not meet expectations? _8_exempted _77_Total	Dept. meeting date ___ or Individual analysis (describe)? Based on previous report	Objective satisfaction unknown at this point. No students took the test.	None required □ Follow-up completion on date __________ xWill examine by end of fall semester and each semester thereafter
Physics 313 students will demonstrate significant learning of calculus-level mechanics, heat, and wave motion	***AP level C Mechanics exam***	***Performance on nationally normed exam***	***Each student scores at least 40%, and students earning an A score at least 60%***	How many students _44_ exceeded _89_met _89_did not meet expectations? _8_exempted _242_Total	Dept. meeting date ___ or Individual analysis (describe)? Based on previous report	Objective not wholly satisfied. Follow-up strategy is to introduce interactive engagement methods and to introduce a math placement test.	None required □ Follow-up completion on date __________ xWill re-examine by end of fall semester and each semester thereafter
Physics 314 students will demonstrate significant learning of calculus-level electricity, magnetism, and light	***AP level C Electricity and Magnetism exam***	***Performance on nationally normed exam***	***Each student scores at least 40%, and students earning an A score at least 60%***	How many students _22_ exceeded _102_met _78_did not meet expectations? _11_exempted _213_Total	Dept. meeting date ___ or Individual analysis (describe)? Based on previous report	Objective not wholly satisfied. Follow-up strategy is to introduce interactive engagement methods and to introduce a math placement test.	None required □ Follow-up completion on date __________ xWill re-examine by end of fall semester and each semester thereafter
Graduating seniors in Physics will demonstrate significant learning of the standard Physics curriculum	***Graduate Record Examination in Physics***	***Performance on nationally normed exam***	***Each student scores at least 50%***	How many students _0_ exceeded _0_met _0_did not meet expectations? _1_exempted _1_Total	Undergraduate advisor is accumulating data on averages in each subfield	Objective satisfaction unknown at this point. Follow-up strategy is to ensure curriculum in each advanced class covers essentials, and to introduce a problem-solving course.	None required □ Follow-up completion on date __________ xWill examine each student as s/he graduates

Assessment results 2009:

Department of ___Physics___________________________

Program-initiated Goal of Objective	Where, When, and How Monitored	Expectation for Satisfactory Performance	Decision Point	Observations of Student Performance	When and By Whom Were Results Analyzed?	Outcome of Analysis	Dept. or Program Follow-up
Physics 111 students will demonstrate significant learning of conceptual physics	***Pre- and post-testing using Force Concept Inventory***	***Performance on nationally normed exam***	***Each student demonstrates a gain g = (posttest-pretest)/(100-pretest) of at least 0.3 and/or final performance of 60% or better.***	_How many students _23 students exceeded _4 meet and _4 did not meet expectations _8 students exempted _39 Total	Dept. meeting date __ or Individual analysis (describe)? Based on previous report	Objective not w holly satisfied. Follow-up strategy is to introduce interactive engagement methods in 111 course	None required ☐ Follow-up completion on date ___________ xWill re-examine by date end of fall semester and each semester thereafter
Physics 213 students will demonstrate significant learning of algebra-level mechanics, heat, and waves	***AP level B Physics. exam (half of it)***	***Performance on nationally normed exam***	***Each student scores at least 40%, and students earning an A score at least 60%.***	_How many students _18_ exceeded _67_met _76_did not meet expectations? _16_exempted _177_Total	Dept. meeting date ___ or Individual analysis (describe)? Based on previous report	Objective not w holly satisfied. Follow-up strategy is to introduce interactive engagement methods, to introduce a math placement test , and to begin to standardize curricula	None required ☐ Follow-up completion on date ___________ xWill re-examine by end of fall semester and each semester thereafter
Physics 214 students will demonstrate significant learning of algebra-level electricity, magetism, llight, and modern physics	***AP level B Physics exam (the other half of it)***	***Performance on nationally normed exam***	***Each student scores at least 40%, and students earning an A score at least 60%.***	How many students _9_ exceeded _23_met _56_did not meet expectations? _4_exempted _92_Total	Dept. meeting date ___ or Individual analysis (describe)? Based on previous report	Objective satisfaction unknow n at this point. No students took the test.	None required ☐ Follow-up completion on date ___________ xWill examine by end of fall semester and each semester thereafter
Physics 313 students will demonstrate significant learning of calculus-level mechanics, heat, and wave motion	***AP level C Mechanics exam***	***Performance on nationally normed exam***	***Each student scores at least 40%, and students earning an A score at least 60%.***	How many students _27_ exceeded _97_met _111_did not meet expectations? _31_exempted _266_Total	Dept. meeting date ___ or Individual analysis (describe)? Based on previous report	Objective not w holly satisfied. Follow-up strategy is to introduce interactive engagement methods and to introduce a math placement test.	None required ☐ Follow-up completion on date ___________ xWill re-examine by end of fall semester and each semester thereafter
Physics 314 students will demonstrate significant learning of calculus-level electricity, magnetism, and light	***AP level C Electricity and Magnetism exam***	***Performance on nationally normed exam***	***Each student scores at least 40%, and students earning an A score at least 60%.***	How many students _17_ exceeded _100_met _69_did not meet expectations? _13_exempted _199_Total	Dept. meeting date ___ or Individual analysis (describe)? Based on previous report	Objective not w holly satisfied. Follow-up strategy is to introduce interactive engagement methods and to introduce a math placement test.	None required ☐ Follow-up completion on date ___________ xWill re-examine by end of fall semester and each semester thereafter
Graduating seniors in Physics will demonstrate significant learning of the standard Physics curriculum	***Graduate Record Examination in Physics***	***Performance on nationally normed exam***	***Each student scores at least 50%***	How many students _0_ exceeded _0_met _0_did not meet expectations? _1_exempted _1_Total	Undergraduate advisor is accumulating data on averages in each subfield	Objective satisfaction unknow n at this point. Follow-up strategy is to ensure curriculum in each advanced class covers essentials, and to introduce a problem-solving course.	None required ☐ Follow-up completion on date ___________ xWill examine each student as s/he graduates

Assesment results 2010:

Department of ___Physics___________________________

Program-initiated Goal of Objective	Where, When, and How Monitored	Expectation for Satisfactory Performance	Decision Point	Observations of Student Performance	When and By Whom Were Results Analyzed?	Outcome of Analysis	Dept. or Program Follow-up
Physics 111 students will demonstrate significant learning of conceptual physics	***Pre- and post-testing using Force Concept Inventory***	***Performance on nationally normed exam***	***Each student demonstrates a gain g = (posttest-pretest)/(100-pretest) of at least 0.3 and/or final performance of 60% or better.***	_How many students _3 students exceeded _21 meet and _14 did not meet expectations _ students exempted _38 Total	Dept. meeting date __ or Individual analysis (describe)? Based on previous report	Objective not wholly satisfied. Follow-up strategy is to introduce interactive engagement methods in 111 course	None required □ Follow-up completion on date ___________ xWill re-examine by date end of fall semester and each semester thereafter
Physics 213 students will demonstrate significant learning of algebra-level mechanics, heat, and waves	***AP level B Physics exam (half of it)***	***Performance on nationally normed exam***	***Each student scores at least 40%, and students earning an A score at least 60%.***	_How many students _33_ exceeded _83_met _84_did not meet expectations? __exempted _200_Total	Dept. meeting date ___ or Individual analysis (describe)? Based on previous report	Objective not wholly satisfied. Follow-up strategy is to introduce interactive engagement methods, to introduce a math placement test , and to begin to standardize curricula	None required □ Follow-up completion on date ___________ xWill re-examine by end of fall semester and each semester thereafter
Physics 214 students will demonstrate significant learning of algebra-level electricity, magetism, llight, and modern physics	***AP level B Physics exam (the other half of it)***	***Performance on nationally normed exam***	***Each student scores at least 40%, and students earning an A score at least 60%.***	How many students _9_ exceeded _32_met _56_did not meet expectations? __exempted _118_Total	Dept. meeting date ___ or Individual analysis (describe)? Based on previous report	Objective satisfaction unknown at this point. No students took the test.	None required □ Follow-up completion on date ___________ xWill examine by end of fall semester and each semester thereafter
Physics 313 students will demonstrate significant learning of calculus-level mechanics, heat, and wave motion	***AP level C Mechanics exam***	***Performance on nationally normed exam***	***Each student scores at least 40%, and students earning an A score at least 60%.***	How many students _35_ exceeded _88_met _122_did not meet expectations? __exempted _245_Total	Dept. meeting date ___ or Individual analysis (describe)? Based on previous report	Objective not wholly satisfied. Follow-up strategy is to introduce interactive engagement methods and to introduce a math placement test.	None required □ Follow-up completion on date ___________ xWill re-examine by end of fall semester and each semester thereafter
Physics 314 students will demonstrate significant learning of calculus-level electricity, magnetism, and light	***AP level C Electricity and Magnetism exam***	***Performance on nationally normed exam***	***Each student scores at least 40%, and students earning an A score at least 60%.***	How many students _23_ exceeded _177_met _80_did not meet expectations? __exempted _180_Total	Dept. meeting date ___ or Individual analysis (describe)? Based on previous report	Objective not wholly satisfied. Follow-up strategy is to introduce interactive engagement methods and to introduce a math placement test.	None required □ Follow-up completion on date ___________ xWill re-examine by end of fall semester and each semester thereafter
Graduating seniors in Physics will demonstrate significant learning of the standard Physics curriculum	***Graduate Record Examination in Physics***	***Performance on nationally normed exam***	***Each student scores at least 50%***	How many students _0_ exceeded _0_met _0_did not meet expectations? _1_exempted _1_Total	Undergraduate advisor is accumulating data on averages in each subfield	Objective satisfaction unknown at this point. Follow-up strategy is to ensure curriculum in each advanced class covers essentials, and to introduce a problem-solving course.	None required □ Follow-up completion on date ___________ xWill examine each student as s/he graduates

UNDERGRADUATE ASSESSMENT PLAN
FOR THE DEPARTMENT OF MATHEMATICS AND STATISTICS

University Mission

"High quality teaching and learning are fundamental goals in all undergraduate, graduate programs…" (Taken from the university's mission statement)

Department Mission

The mission of the undergraduate program in Mathematics and Statistics is to provide a broadly based program in undergraduate level mathematics and statistics which will prepare students either for graduate study in mathematics and statistics; or for mathematics-statistics related employment in academic, industrial or governmental positions.

Goals

1. Students majoring in mathematics should possess a common core of mathematical skills, leading to a better understanding of mathematical reasoning.
2. Students who wish to do graduate work in mathematics should have an adequate understanding of Advanced Calculus and Ordinary Differential Equations.
3. Students who wish to do graduate work in engineering or one of the mathematical sciences, should have an adequate understanding of Calculus, Ordinary Differential Equations, and Numerical Methods.
4. Students who wish to teach mathematics should have an adequate understanding of Advanced Calculus, Ordinary Differential Equations, and Statistics.
5. Students who wish to pursue a career in business or industry should possess knowledge of diverse statistical techniques.

Learner Outcomes

Students who complete our core courses will demonstrate competence in the computational skill taught in these courses as well as a familiarity with the underlying concepts of these courses.

Assessment of the Program Goals

A. The department has selected the following five representative core courses to assess the program goals:

Course	Goal(s) Assessed
MATH 415 Introduction to Advanced Mathematics	1
MATH 547 Advanced Calculus I	1, 2, 3, and 4
MATH 551 Numerical Methods	3
MATH 555 Differential Equations	2, 3, and 4
STAT 571 Statistical Methods I	4 and 5

At the end of each semester, the department will collect from each instructor of one of the core courses listed above the following materials:

- The syllabus.
- Copies of the tests given.
- Copies of representative graded examples of student work on each test.
- The graded Final Comprehensive Examinations for all students.

This material will constitute the basic file of information on the program offered to students. This file will be reviewed annually in a form which maintains student anonymity by an external consultant, who will visit the department for a period of two days to examine the file and form a complete and first-hand impression of the program being assessed. This consultant, who will be a mathematician from a university outside of Kansas or a professional mathematician from business, industry, or research, will evaluate the program and mail a brief written report to the department.

B. At the end of each semester, graduating seniors will complete the *Graduating Senior Exit Survey.* Through this survey the Department of Mathematics and Statistics will assess the program goals.

C. Every five years the department will survey past graduates in Mathematics and Statistics. This survey will also be used to measure and assess the program goals.

Learner Outcomes Assessment

1. Each representative core course will be evaluated by a comprehensive final exam. This final exam will include, for assessment purposes, 2 or 3 problems selected from a list of problems prepared in advance by the department. The list of problems will contain about 15-25 questions (or problems) emphasizing fundamental concepts of the course. The list will be provided to the students in advance, along with an explanation of its role in the final exam.
2. An individual file will be created and maintained for each current math major. For each current major, this file will include (a) graded final exams in those representative core courses which he or she participated in, (b) his or her average score (percent) in those same representative core courses. These files will be kept for 5 years following graduation.

3. The department will provide to the consultant, at his or her request, any available and appropriate statistical information about math majors.

Results

The following is a brief outline of the most recent report from Professor V. Wickerhauser of Washington University in St. Louis, our external consultant who reviewed the basic file for Math 551 in March 2004.

1. The workload is substantial. To spread some of this workload, it may aid the class to have Math 551 students from previous semesters available in the computer lab as consultants.
2. The choice of textbook is excellent.
3. The course preparation is substantial.
4. The midterm project is challenging and the final examination has a reasonable difficulty gradient: about half the students demonstrated competence on the two difficult questions in the final.
5. The anonymous student evaluations are comparable to those for an upper division Mathematics course as at Washington University.

Feedback Loop

The faculty who do the most scientific computing (DeLillo and Elcrat) will continue to integrate MATLAB into the Math 551 curriculum and exploit the computer room for instructional purposes. The coordination between the introductory MATLAB course, Math 451, and Math 551 will be maintained through and we will make sample programs available to beginning students.

Concurrent Enrollment Assessment Plan

Prepared by:
Stephen W. Brady
Associate Professor of Mathematics and Statistics and
Director, College Algebra Program

Universities recommend that any high school student who wishes to attend any university or college should take four years of mathematics in high school. Three years of mathematics should be minimal preparation. The first college level course in mathematics at any university in the world is Calculus. All other courses before Calculus are remedial whether or not credit is given for those courses. Wichita State University's general education basic skill requirements in mathematics for graduation came from the realization that most of our students did not enroll initially with have enough prior training in mathematics. Due to our previous open admission policy many were admitted with less than adequate mathematics background to be successful in college. The idea was to raise them to a college entry level of mathematics before they graduated from WSU by requiring knowledge of College Algebra (or higher level mathematics) as part of the general education program. Although this goal has been made much easier to attain due to the recent rule that the basic skills must be achieved in the first forty-eight hours of coursework, it is much better if the skills are achieved before entering college. Concurrent enrollment classes in mathematics in College Algebra, Trigonometry, and Pre-calculus using the "carrot" of college credit have encouraged students to take more mathematics while still in high school in order to raise their mathematical knowledge level closer to where it should be for college entry.

College Algebra

For the last fifteen years the comprehensive departmental final for Math 111, College Algebra has been used as part of an overall assessment of the course. The final is worth at least 30% of the course grade for each section of M111. A student successfully satisfies the final assessment by scoring at least 50% on the final together with a C or better for the semester overall. The weight of 30% for the final brings the course grade down (in most cases) to the D or F level for anyone not achieving a score of at least 50% on the final exam. For courses taught as concurrent enrollment the same weight (30%) for the course grade will be used. If a high school has any mathematics concurrent enrollment class taught by a teacher who does not have a master's degree, all sections in the school use the same department final as that given by the university. In such cases, the assessment criteria are identical. When periodic overall assessments of the university courses are done, the concurrent enrollment classes will be included. Comparisons will be easy to draw concerning student learning outcomes in both environments and how closely concurrent enrollment classes mirror the university classes. In a high school whose mathematical concurrent enrollment classes are taught by teachers with master's degrees, the final does not have to be the same as the university final but the assessment and grading weight are the same. Finals that are different from the one given by the university are approved by the College Algebra Program Director. These classes will be included in any overall assessment of college algebra courses. Comparisons will be made between these classes, university classes, and those concurrent enrollment classes using the university final. The university's STPE assessment is used to assess each concurrent enrollment class to evaluate student perception of the instructor and course. In addition, any high school assessment of student learning outcomes that is part of a concurrent enrollment course will be requested from the school and compared with our own assessments.

The prerequisites for university College Algebra classes are two years of high school algebra or equivalent and a satisfactory score on the department placement exam or math ACT exam or math SAT exam. Satisfactory scores have been determined to be 15 of 32 on the department placement exam, 20 for math ACT, and 460 for math SAT. The department placement exam, while not a post-assessment tool for College Algebra is an assessment tool for our remedial courses and for a student's previous mathematical preparation. Part of the way we can affect student learning outcomes in College Algebra is to make sure the student is (mathematically) ready to enroll in the course. The department feels that our remedial courses themselves have been excellent preparation. The placement exam is also working well. Most high school mathematics concurrent enrollment courses involve the second semester of a two semester sequence. In order to qualify for concurrent enrollment in such a course, an A or B is required in the first semester. So, a concurrent enrollment student shows they are ready for college credit by above average achievement in previous semesters.

College Algebra has the following overall course outcomes.

The student will understand the body of mathematical knowledge identified as College Algebra in order to:

1. Build a foundation for mathematical problem solving.
2. Apply problem-solving techniques to model both mathematical and real-world contexts.
3. Use mathematical language and symbols as a means of communication while reading, writing, speaking, and listening.
4. Apply critical thinking and analytical reasoning skills in mathematical settings.
5. Retrieve and utilize mathematical skills as opportunities arise.
6. Make connections between mathematical problem solving and its application in other settings.

These outcomes are part of a Course Syllabus that spells out in detail the sections to be covered in College Algebra, the time to be spent on each text section, and the outcomes for each text section. The university final exam is closely tied to these outcomes. Each university class section in College Algebra uses the same book and materials. Each concurrent enrollment section in each school district uses the same text. Although textbooks may be different from ours and differ from district to district, this is not a problem since texts used in the high schools are standard college level texts acceptable for our courses and cover the same material. The university course syllabus for College Algebra (together with the goals and outcomes) are distributed to the high school concurrent enrollment teachers as well as both sample finals and previous university course finals. Concurrent enrollment teachers are encouraged to utilize as much of this material as is possible. Two meetings (training sessions) have been held each year since 2006 with all the mathematics concurrent enrollment teachers. Course procedures, final exams, assessments, and curricula have been discussed at these meetings with the goal of tying the concurrent enrollment experience as closely as possible with the university course. Meetings with the concurrent enrollment teachers will be conducted each fall for preparation for the spring concurrent enrollment classes. Meetings will be held in the spring to discuss the spring classes and finals.

A standing committee composed of experienced faculty oversees the university course contents, the textbook, the length of time to be spent on topics, etc. The mathematics portion of the basic skills requirement is overseen by a professor in the department of Mathematics and Statistics who carries the title of College Algebra Director. Concurrent enrollment mathematics courses and assessment will be overseen by the same Director. The overall rules governing College Algebra as concurrent enrollment will be the same as those for the university equivalent.

Trigonometry, Math 123 and Math 112, Pre-Calculus

The College Algebra portion of Pre-calculus (a combination of Algebra and Trigonometry), M112, is considered to be equivalent to M111 and is an alternate path that can be used to satisfy the basic skills requirement. It is usually taken by those who have a need or desire to take higher level mathematics but who do not feel ready to take Calculus. Trigonometry at our university has College Algebra as a pre-requisite. Both courses have course syllabi with similar outcomes as those stated above for College Algebra. The classes are taught mostly by regular faculty with some classes taught occasionally by our more senior graduate teaching assistants. Each instructor gives their own final and is responsible for all aspects of the course. Finals for concurrent enrollment classes are submitted and approved by the College Algebra Program Director. Historically, the only assessment done is by the faculty teaching the course and by grade distributions. With respect to concurrent enrollment, all rules and goals governing the College Algebra course discussed above are the same for Trigonometry and Pre-calculus. Concurrent enrollment class assessments will be compared to our Instructor's assessments of their courses.

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April 13, 2008

Professor Ziqi Sun
Department of Mathematics
Wichita State University
1845 N. Fairmount
Wichita, KS 67260

Dear Professor Sun:

Thank you for the opportunity to visit your department and examine the content of your course Numerical Methods, Math 551. I have carefully reviewed the course material, including exams, homework, and the textbook. I have also asked your colleagues questions about the course.

Math 551 is populated primarily by juniors and seniors, who already are knowledgeable in programming in MATLAB. The students also know calculus and linear algebra. The course Math 551 introduces students to numerical methods for the solution of problems that arise in science and engineering. The course is likely to be very useful for students.

The textbook "Numerical Methods with MATLAB" by C. B. Moler is a very good choice, in particular when used by an outstanding numerical analyst such as Alan Elcrat, who is able to answer questions the students might have, but which are not discussed in the book. The book focuses on problem solving and introduces students to state-of-the-art methods and software. The book comes with nice software demos that help students understand important concepts.

The instructor, Alan Elcrat, complemented the book with his own material. For instance, the remainder formula for polynomial interpolation and the distribution of interpolation points were discussed. These topics are not treated in the book. I think these extensions of the book provide students with valuable insight into polynomial interpolation and addresses the question when to use piecewise polynomial approximants instead of a "global" interpolation polynomial. Also, Newton's method for determining zeros of a real-valued function was treated in more detail by the instructor than in the book. Finally, the book was complemented with larger projects related to the material covered.

I would think that the students find the course to be of moderate difficulty. The homework assignments and projects are likely to keep them busy, The homework is well chosen, and deepens the students' understanding of the material covered. It also illustrates the use of computational mathematics. This is alos tru for the projects.

I had access to Exams 1-3. The questions reflect the material covered in the course. To get full credit, students must master the material well and have thought about the issues discussed in the course. I do not consider the exams easy. Nevertheless, some students did very well (one got 100). This shows that some students are learning a lot.

I consider Math 551 a very well-designed course. The effort of the instructor, and, in particular, the material added to the textbook, make the course more substantial and provide the students with a much better understanding than the textbook alone.

Sincerely,

Lothar Reichel

Lothar Reichel
Professor of Mathematics

UNDERGRADUATE ASSESSMENT PLAN
FOR THE DEPARTMENT OF MATHEMATICS AND STATISTICS

The stated objectives is:

> "Students who wish to do graduate work in engineering or one of the mathematical sciences, should have an adequate understanding of Calculus, Ordinary Differential Equations, and Numerical Methods"

1. Assuming all went as planned and the students diligently completed the syllabus, assign a grade (A-F) to the syllabus indicating how well studying these topics would help students satisfy the objectives

1. A

2. Now look at the tests given and grade them (as a single entity) according to how well achieving good scores on them would indicate that students have satisfied the objective.

2. A

3. Finally, consider the graded examples of student work (again, as a single entity) and assign a grade indicating how well their performances demonstrate that students have satisfied the objective.

3. A

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DEPARTMENT OF STATISTICS
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BERKELEY, CALIFORNIA 94720

April 21, 2009

Professor Ziqi Sun
Department of Mathematics and Statistics
Wichita State University
Wichita, KS 67260

Dear Professor Sun,

Thank you very much for the invitation to visit your department and to assess the course Stat 572 "Statistical Methods II". I had the opportunity to talk to Professor Dharam Chopra about the course in details and to examine the course material, including the syllabus, textbooks, homework assignments, and exams. I am happy to say that this is a very well designed and well taught course.

Stat 572 is the second part of a one-year sequence (Stat 571-572) on statistics. While the basic concepts in statistical inference, including estimation, confidence intervals and hypothesis testing, and the required probability theory are taught in Stat 571, Stat 572 is a survey of more advanced topics such as nonparametric statistical techniques, regression, analysis of variance, and design of experiments, all of which are particularly important in statistical practice. The well received textbook "Statistical Concepts and Methods" by G. K. Bhattacharyya and R. A. Johnson gives an excellent account of all these topics, with many real-life examples and helpful exercises. I personally have used this book before, and I can attest that it is a superb textbook at the right level for this kind of course. In addition to the aforementioned topics, the book also covers two subjects that are not mentioned in the course syllabus in the Wichita State University catalog: analysis of categorical data and sample surveys. It appears that no other course offered by the department covers either analysis of categorical data or sample surveys. I am glad to know that both of these essential topics have been taught in Math 572 as well, even though they were overlooked in the officially published course syllabus. Including these topics makes the course more complete and attractive. Professor Chopra also used M.R. Spiegel, J. J. Schiller and R. A. Srinivasan's book "Probability and Statistics" in Schaum's Outlines series as a supplement to the main textbook in order to strengthen the students' skills in handling continuous distributions. This is a very good idea.

I have reviewed the assigned homework. It provided the students with adequate practices to help them understand and absorb the material learned in class. The homework and exam questions were representative of the course content, and were very carefully and fairly graded. The course, in my opinion, is certainly successful in helping the students acquire knowledge of diverse statistical techniques, as stated in the course objectives.

While talking to Professor Chopra, I realized that at Wichita State University, introductory statistics courses are also offered at other departments (such as engineering), and sometimes more than one similar course is offered at the same time. At my own university, the Statistics Department offers all sorts of introductory statistics courses serving the entire campus community, from physical sciences, engineering, life sciences, to social sciences and business. Like calculus, I believe that ideally instruction of introductory statistics should also be consolidated at the Department of Mathematics and Statistics and be taught be statisticians.

Sincerely yours,

Ching-Shui Cheng
Professor

UNDERGRADUATE ASSESSMENT PLAN FOR THE DEPARTMENT OF MATHEMATICS AND STATISTICS

The stated objectives are:

> "Students who wish to teach mathematics should have an adequate understanding of Advanced Calculus, Ordinary Differential Equations, and Statistics."
>
> "Students who wish to pursue a career in business or industry should possess knowledge of diverse statistical techniques."

1. Assuming all went as planned and the students diligently completed the syllabus, assign a grade (A-F) to the syllabus indicating how well studying these topics would help students satisfy the objectives

1. A

2. Now look at the tests given and grade them (as a single entity) according to how well achieving good scores on them would indicate that students have satisfied the objective.

2. A

3. Finally, consider the graded examples of student work (again, as a single entity) and assign a grade indicating how well their performances demonstrate that students have satisfied the objective.

3. A

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University of Waterloo,
Waterloo, Ontario
Canada, N2L 1E6

April 27, 2010

Professor Siqi Sun
Department of Mathematics and Statistics
Wichita State University
Wichita, KS 67226
USA

Dear Professor Sun:

During my visit I examined material for four sections of Math 555 from both the Spring and Fall terms of last year and looked at all of the final exams for these sections, not just the samples of student exams provided. As well I read portions of the text by Boyce and DiPrima.

Although the syllabuses for the course sections differed in minor ways, all four covered the important topics and met the challenge of providing for students intent on either teaching, graduate work, or engineering employment in industry. The text is clearly written with adequate examples and does provide motivation for topics as they are introduced. The samples of in-class tests that were provided showed that the sections, although independent, were all well-paced. There was no evidence that too many special topics or lengthy applications were introduced that might distract from learning the basic material. However, it is always important that basic applications are covered particularly in calculus and differential equations courses and the syllabuses show that this was done for these 2009 sections. The grading was balanced and the method of determining the final grades straightforward in each section, making students more aware of their responsibility for their own success. The final exams all emphasized Laplace transforms, the final topic in all of the sections. The final exams of all students in the four sections had relatively few questions left unattempted, indicating that the instructors covered material in sufficient detail and at a pace that all levels of students were able to progress.

I am impressed with the efforts of the department to monitor their courses and maintain standards that ensuring good understanding of the basic facts in all their courses.

Sincerely yours

Larry Cummings

Professor Larry Cummings

encl: Undergraduate Assessment Plan

UNDERGRADUATE ASSESSMENT PLAN
FOR THE DEPARTMENT OF MATHEMATICS AND STATISTICS

The stated objectives are:

> "Students who wish to do graduate work in mathematics should have an adequate understanding of Advanced Calculus and Ordinary Differential Equations."
>
> "Students who wish to do graduate work in engineering or one of the mathematical sciences, should have an adequate understanding of Calculus, Ordinary Differential Equations, and Numerical Methods"
>
> "Students who wish to teach mathematics should have an adequate understanding of Advanced Calculus, Ordinary Differential Equations, and Statistics."

1. Assuming all went as planned and the students diligently completed the syllabus, assign a grade (A-F) to the syllabus indicating how well studying these topics would help students satisfy the objectives

1. A

2. Now look at the tests given and grade them (as a single entity) according to how well achieving good scores on them would indicate that students have satisfied the objective.

2. A

3. Finally, consider the graded examples of student work (again, as a single entity) and assign a grade indicating how well their performances demonstrate that students have satisfied the objective.

3. A

NJIT
New Jersey's Science & Technology University

COLLEGE OF SCIENCE & LIBERAL ARTS

New Jersey Institute of Technology
Department of Mathematical Sciences
University Heights
Newark, NJ 07102-1982

Denis Blackmore

10 April 2011

Professor Ziqi Sun
Department of Mathematics and Statistics
Wichita State University
Wichita, Kansas 67260, USA

Dear Professor Sun:

First let me express my thanks for the invitation to visit your department and to review the courses that I have evaluated in the sequel. Undertaking the course reviews along with the more traditional invitation to present a talk on my research in your Lecture Series made for a unique and interesting experience, rendered all the more enjoyable by the hospitality and amicability of you and your faculty colleagues.

The courses I was asked to review are Math 415, (Introduction to Advanced Mathematics) and Math 547 (Advanced Calculus I) as they were by taught by two instructors in the spring and fall of 2010. I was given ample data on which to base my evaluations, including course descriptions and textbooks, syllabi, graded exams and submitted homework solutions, final grades and student evaluations. Additional conversations with the instructors and other faculty members also served to enhance my knowledge of the course histories and dynamics, along with the nature of the students in each of the courses. All in all, I would say that you and your colleagues were kind enough to provide more than enough information for me to make a well-informed evaluation of the quality, degree of success and efficacy of these course offerings.

Math 415 is intended as a course in the fundamentals of mathematics – with an emphasis on developing proficiency in rendering proofs – designed to prepare students of mathematics for the more rigorous courses, such as advanced calculus that they must master if they hope to become mathematical researchers or mathematics teachers at the secondary level. The textbooks used, *Proofs and Fundamentals*, by E. Bloch, and *Mathematical Proofs*, 2nd ed., by G. Chartrand *et al.*, both contain the same basic core material, which includes some informal logic (set theory, the propositional calculus, and a bit of quantification theory), a description of direct and indirect proof strategies, principles of induction, some number theory, and a glimpse of cardinality theory. Both books are well-suited to the syllabus and goals of Math 415, but I prefer the second text because it also treats $\varepsilon - \delta$ and $\varepsilon - N$ proofs, which are ubiquitous in advanced calculus; the course, I believe, for which Math 415 is designed to serve as a fundamental preparatory experience.

Just as good writers must first learn the basics of the language (grammar), study the work of professionals, practice by writing compositions and short stories that are critiqued by experts, then immerse themselves in the masters, and ultimately find their own voice; success in mathematics requires mastery of the fundamentals of mathematical logic and proof writing, taking ever more advanced courses in which one's work is perused and corrected by experts, and studying the work of the masters as one matures mathematically. Math 415 is designed to fulfill the initial requirements of this mathematical journey, and as far as I can tell it succeeds admirably.

The instructors employed somewhat different styles, but both meticulously corrected many homework problems and several tests including a final examination – all of which very effectively measured the students' knowledge of the course material and provided excellent preparation for the increasing rigors of more advanced mathematics courses. Near the end of the courses, the tests and homework showed that the best students were very proficient in crafting fairly complicated proofs of moderate length. But what impressed me more was the fact that even the weakest students showed much improved skills in proof rendering and the middle level students had made significant strides in their ability to prove some rather substantial results with acceptable rigor. In sum, the instructors did an outstanding job in teaching the course – which is well conceived to meet the envisaged goals of preparing students for more advanced studies in mathematics, science and even engineering. All of the students learned a good deal from these courses and their instructors as is clearly borne out by the excellent overall distributions in the final grades and the very good student evaluations received by the professors.

The same two professors who taught Math 415 in the spring and fall of 2010 also taught Math 457 (Advanced Calculus I) in the fall and spring of 2010, respectively, and also achieved excellent results. Math 457 is a traditional course in advanced calculus of real-valued functions of a single real variable, with the usual staple of topics: These are the treatment of the real numbers as a complete ordered field, followed by rigorous descriptions of limits, continuity, differentiability, Riemann integration, sequences and infinite series, with a sprinkling of topology. In one case, the instructor also included a prevue of multivariable advanced calculus, which is what I like to do when I teach the equivalent of this course at NJIT, since several of the concepts and results generalize so naturally to higher dimensions. One instructor used *Elementary Analysis: The Theory of Calculus*, by K. Ross, and the other chose the classic text *The Elements of Real Analysis,* by R. Bartle. Both of these textbooks are challenging and very well suited for the course.

These instructors, just as in Math 415, assigned many homework problems, which they painstakingly graded – with helpful comments. They also gave tests and examinations that were well designed to gauge the students' mastery of the material. It is clear from the student evaluations that their efforts were greatly appreciated by their classes, and this is also reflected in the strong positive skewing of the final grade distributions. One of the instructors also provided some excellent supplementary notes to help the students. Obviously, both instructors invested a great deal of time and effort in creating an effective learning environment for their students – and this yielded significant dividends. Once again I was strongly impressed by the performance of the best students on homework and exams and especially by the absorption of course concepts and methods of analysis evinced by the weaker students. Obviously, both instructors did outstanding work in teaching these courses.

In summary, both of these courses and instructors were very successful in almost all aspects. There can be little doubt concerning the excellence of the design, presentation and relevance of these courses, and I believe that all who have or shall take these courses are bound to benefit greatly from the experience. To put it simply, my only real advice for these courses is to keep up the very good work.

Sincerely yours,

Denis Blackmore

Denis Blackmore
Professor of Mathematical Sciences
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UNDERGRADUATE ASSESSMENT PLAN
FOR THE DEPARTMENT OF MATHEMATICS AND STATISTICS

The stated objectives are:

> "Students majoring in mathematics should possess a common core of mathematical skills, leading to a better understanding of mathematical reasoning."
>
> "Students who wish to do graduate work in mathematics should have an adequate understanding of Advanced Calculus and Ordinary Differential Equations."
>
> "Students who wish to teach mathematics should have an adequate understanding of Advanced Calculus, Ordinary Differential Equations and Statistics."

1. Assuming all went as planned and the students dutifully completed the syllabus, assign a grade (A-F) to the syllabus indicating how well studying these topics would help students satisfy the objectives.

1. __A__

2. Now look at the tests given and grade them (as a single entity) according to how well achieving good scores on them would indicate that students have satisfied the objective.

2. __A__

3. Finally, consider the graded examples of student work (again, as a single entity) and assign a grade indicating how well their performances demonstrate that the students have satisfied the objective.

3. __A__

Denis Blackmore 4/10/11

DEPARTMENT OF MATHEMATICS, STATISTICS, AND PHYSICS

2012 SELF-STUDY REPORT

Attachment #2 (B)

Assessment plans and results

Graduate Programs

GRADUATE PROGRAM ASSESSMENT PLAN

Department : Mathematics, Statistics, Physics

Program Name: Mathematics (M.S.)

Contact person: Kenneth Miller, ext 3959, miller@math.wichita.edu

Date of revision: June 12, 2012

I. Program Mission:

The mission of the M.S. program in Mathematics is to provide a broadly based, flexible program in graduate level mathematics and statistics which will prepare students either for doctoral study in mathematics and statistics; or for mathematics-statistics related employment in academic, industrial or governmental positions.

II. Program Constituents:

The students in the M. S. Degree program in Mathematics are the program constituents.

III. Program Objectives:

1. To provide students with a program of study in which they build on the knowledge acquired in an undergraduate program in mathematics and statistics by taking more advanced course work (and optionally research work) in certain areas of mathematics and/or statistics.

2. To prepare its graduates for either
   - further study in mathematics and statistics at the PhD level,
   - a career in teaching at the high school or junior college level,
   - a career in science, industry or government that requires graduate level training in mathematics or statistics.

IV. Assessment of Program Objectives:

1. This objective is assessed through the learner outcomes given below.

2. We maintain files containing information concerning what each graduate does upon graduation: employment obtained or further education pursued. The MS program expects at least 85% of the graduates of the program to obtain mathematics-statistics related employment or admission to a doctoral program within one year of graduation.

V. (Student) Learner Outcomes:

1. The student should acquire knowledge of mathematical and statistical theory and methods taught in at least 8 graduate courses (24 credit hours) at the 700 level or above in Mathematics or Statistics. Students have flexibility in choosing which areas to learn, but must maintain a 3.0 gpa in all courses used toward the degree.

2. The student should master, in depth, three knowledge areas in mathematics and/or statistics. The three knowledge areas are chosen by the student, in consultation with an advisor, from among the nine areas: Algebra, Topology, Real Analysis, Complex Analysis, Partial Differential Equations, Numerical Analysis, Regression Analysis/Analysis of Variance, Theory of Statistics, Applied Statistics.

3. The student should be able to communicate mathematical concepts effectively and accurately in writing.

4. The student should be able to orally communicate mathematical concepts effectively and accurately.

VI. Assessment of (Student) Learner Outcomes:

1. Final assessment of whether the student has taken the required coursework is done when the student applies for the degree. Preliminary assessment is done when the student files a Plan of Study, usually in the second semester of study. Grade point averages are monitored for all students, each semester. At the end of each Spring semester a record is maintained of the g.p.a. of every student who has been enrolled in the program (taking at least one class) during the Fiscal year. Each year 4 numbers are reported: the total number of students enrolled in the program; the number of those students with a g.p.a. greater than or equal to 3.0; the number with a g.p.a. greater than or equal to 3.5; and the number with a g.p.a. greater than or equal to 3.9.

2. Student's mastery of knowledge of subject areas at the conclusion of the program will be assessed via the oral Comprehensive Exam. Faculty on the examining committee will evaluate, for assessment purposes, the student's performance in answering questions from each of the three knowledge areas the student has chosen to master.

3. and 4. The student's ability to communicate mathematical concepts will be assessed during the Comprehensive Exam. Each faculty member on the examining committee will assess, using a numerical scale, both the student's written work and oral presentation during the exam.

5. Records will be maintained of outstanding achievement by students in the program, including awards, such as Graduate School awards, or other forms of recognition.

The graduate coordinator is responsible for collecting the data for these assessment activities.

VII. Feedback Loop Used by the Faculty.

The department has a Graduate Assessment Committee composed of the graduate coordinator and three other members appointed by the department chairperson. This committee meets annually to review the results of the assessment. The same committee reviews the department's assessment process periodically. The committee will make recommendations to the graduate faculty based on assessment results.

GRADUATE PROGRAM ASSESSMENT PLAN

Department : Mathematics, Statistics, Physics

Program Name: Applied Mathematics (PhD)

Contact person: Kenneth Miller, ext 3959, miller@math.wichita.edu

Date of revision: June 12, 2012

I. Program Mission:

The mission of the Ph.D. program in Applied Mathematics is to provide a high quality doctoral program in applied mathematics that will prepare students as research mathematicians for employment in either academic, industrial or governmental positions.

II. Program Constituents:

The students in the Ph.D. Degree program in Applied Mathematics are the program constituents.

III. Program Objectives:

1. To enable students to reach the forefront of knowledge in some area of applied mathematics and to expand knowledge in this area through original research while also acquiring a broad grasp of the current state of the field.

2. To prepare its graduates for either an academic career in teaching at the college or university level or a non-academic research career as an applied mathematician, statistician or scientist.

IV. Assessment of Program Objectives:

1. This objective is assessed through the learner outcomes given in Section V.

2. We maintain files containing information concerning each graduates employment upon graduation. It is expected that at least 85% of program graduates will obtain employment in either academia, business or industry.

V. (Student) Learner Outcomes:

1. Students shall demonstrate mastery of the core subjects of Real Analysis, Linear Algebra and Numerical Linear Algebra.

2. Students shall demonstrate mastery of their particular area of research specialization.

3. Students shall master some area of specialization and engage in current research.

4. Students shall demonstrate the ability to present their research orally.

5. Each student shall complete a significant research project that contributes to the knowledge base in the field. The results of this research are presented in the Ph.D. dissertation.

VI. Assessment of (Student) Learner Outcomes:

1. Mastery of the core topics is assessed through the written Qualifying Exam given after approximately one year in the program. The student's knowledge of each core subject will be evaluated separately on a scale of 1 to 5 by two members of the examining committee. Summary results of the level of student achievement will be reported annually.

2. Mastery of the area of specialization is assessed during the oral Preliminary Exam. Each member of the student's PhD committee will evaluate the student's mastery of the subject on a scale of 1 to 5.

3. Studying an area of specialization and engaging in research is a program requirement. This learmer outcome is assessed by student progress through the program. Records will be maintained to keep track of the proportion of students reaching each stage in the program. In particular: a) How many of students admitted (and enrolled) later pass the Qualifying Exam; b) How many students who pass the Qualifying Exam later pass the Preliminary Exam; c) How many students who pass the Preliminary Exam later complete the degree.

4. Ability to present research orally is assessed by the student's PhD committee both at the time of the Preliminary Exam and the Final Exam. Each member of the student's PhD committee will evaluate the student on a scale of 1 to 5.

5. a) The dissertation is assessed by the student's PhD committee during the dissertation defense. Each member of the student's PhD committee will evaluate the student's research work on a scale of 1 to 5.

   b) To further assess the quality of research conducted by students in the program the graduate coordinator will maintain information indicating whether each graduate a) has presented a paper at a regional, national or international meeting prior to graduation, and b) has had a paper accepted for publication in a refereed journal within four years of graduation.

6. Records will be maintained of outstanding achievement by students in the program, including awards, such as Graduate School awards, or other forms of recognition.

VII. Feedback Loop Used by the Faculty.

The department had a Graduate Assessment Committee composed of the graduate coordinator and three other members appointed by the department chairperson. This committee meets annually to review the results of the assessment. The same committee reviews the department's assessment process periodically. The committee will make recommendations to the graduate faculty based on assessment results.

WICHITA STATE UNIVERSITY

GRADUATE PROGRAM ANNUAL ASSESSMENT DATA REPORT

Department : Mathematics, Statistics, Physics

Program: Mathematics (M.S.)

Contact person: Kenneth Miller, ext 3959, miller@math.wichita.edu

Date of submission: March 16, 2012

Learning Outcomes (most programs will have multiple outcomes)	Assessment Tool (e.g., portfolios, rubrics, exams)	Target/Criteria (desired program level achievement)	Results	Analysis
Students acquire knowledge of mathematical and statistical theory and methods.	Grade point average. For each year 4 numbers are recorded: total # students; Number with gpa>=3.0; gpa>=3.5; gpa>=3.9	90% of students enrolled in program have gpa>=3.0. Other data indicate grade distribution.	FY11: 31,28,24,9	Target met. Not an excessive number of A grades
Students are able to solve graduate level mathematics and statistics problems.	Comprehensive Exam. Three examiners rate students on a scale of 1 to 5 (high) in 4 subjects	Two percentages are given: scores of 3 or above; scores of 5. Target: 3+: 95%	FY11:3+:100%,5: 50%	Target met.
Students are able to communicate mathematical concepts in writing.	Comprehensive Exam. Three examiners rate students on a scale of 1 to 5 (high)	Two percentages are given: scores of 3 or above; scores of 5. Target: 3+: 95%+	FY11:3+:100%,5: 75%	Target met.
Students are able to orally communicate mathematical concepts.	Comprehensive Exam. Three examiners rate students on a scale of 1 to 5 (high)	Two percentages are given: scores of 3 or above; scores of 5. Target: 3+: 95%+	FY11:3+:100%,5:100 %	Target met.

WICHITA STATE UNIVERSITY

GRADUATE PROGRAM ANNUAL ASSESSMENT DATA REPORT

Department : Mathematics, Statistics, Physics

Program: Applied Mathematics (PhD)

Contact person: Kenneth Miller, ext 3959, miller@math.wichita.edu

Date of submission: March 16, 2012

Learning Outcomes (most programs will have multiple outcomes)	Assessment Tool (e.g., portfolios, rubrics, exams)	Target/Criteria (desired program level achievement)	Results	Analysis
Mastery of core subjects	Qualifying Exam	80% of those taking exam pass	FY11 8/8 pass	Target exceeded
Mastery of research specialization area	Preliminary Exam	90% of those taking exam pass	FY11 2/2 pass	Target exceeded
Acquire knowledge in a research area and engage in current research	Progress in program	75% of students who pass Qualifying Exam should finish dissertation within 6 years	67% of students who passed Qual from FY01 to FY05 graduated within 6 years	One student left program soon after passing Qual. One did not make satisfactory progress.
Complete significant, publishable research	Dissertation Defense	100% of those defending pass	FY11 2/2 pass	Target met
Complete significant, publishable research	Post graduation publication record	60% of doctoral graduates should publish the results of dissertation within 4 years	7/10 graduates from FY04 to FY11 published within 4 years	Target exceeded

WICHITA STATE UNIVERSITY

GRADUATE PROGRAM ANNUAL ASSESSMENT DATA REPORT

Department : Mathematics, Statistics, Physics Reporting period: FY-13

Program: Applied Mathematics (PhD)

Contact person:

Date of submission:

Learning Outcomes (most programs will have multiple outcomes)	Assessment Tool (e.g., portfolios, rubrics, exams)	Target/Criteria (desired program level achievement)	Results	Analysis
Students should master core subjects	Qualifying Exam Each examiner rates each student on a scale of 1 to 5 (high) on each subject	80% of scores are 3 or higher		
Students should master area of research specialization	Preliminary Exam Each examiner rates student on a scale of 1 to 5 (high)	90% of scores are 3 or higher		
Students should master some area of specialization and engage in current research	Progress in program	75% of students who pass Qualifying Exam should finish dissertation within 6 years		
Student should be able to orally communicate mathematical concepts	Preliminary and Final Exam Each examiner rates student on a scale of 1 to 5 (high)	90% of scores are 3 or higher		
Students should complete significant, publishable research	Dissertation Defense Each examiner rates student on a scale of 1 to 5 (high)	100% of scores are 3 or higher		
Students should complete significant, publishable research	Post graduation publication record	60% of doctoral graduates should publish the results of dissertation within 4 years		

DEPARTMENT OF MATHEMATICS, STATISTICS, AND PHYSICS

2012 SELF-STUDY REPORT

Attachment #3.

Cost comparison of producing one credit hour by our department (MSP) versus all WSU Colleges

Abbreviated version

Cost comparison of producing one credit hour by our department (MSP) and all WSU Colleges

UNIT	FY 2012 TOTAL BUDGET (GU+RU)	TOTAL CREDIT HOURS 2012 AY	**total cost per cr. Hr.**	**GU cost per cr. Hr.**	PERCENT of WSU CREDIT HOURS	PERCENT of TOTAL AA BUDGET
Academic Affairs	$169,479,078	317830	$533	**$268**	100.0%	100.0%
Fine Arts College	$7,441,944	22521	$330	**$291**	7.1%	4.4%
Engineering College	$8,081,311	28145	$287	**$250**	8.9%	4.8%
College of Education	$5,780,339	25201	$229	**$221**	7.9%	3.4%
Health Prof. College	$13,139,345	38678	$340	**$216**	12.2%	7.8%
Business College	$11,641,265	37370	$312	**$214**	11.8%	6.9%
LAS College	$25,384,157	165570	$153	**$146**	52.1%	15.0%
MSP	$3,707,865	29213	$127	**$126**	9.2%	2.2%

Full version

Cost comparison of producing one credit hour by our department (MSP) and all WSU Colleges

UNIT	FY 2012 GU	FY2012 RU	FY 2012 TOTAL	CREDIT HOURS Fall 11	CREDIT HOURS Spring 12	TOTAL CREDIT HOURS 2012 AY	**total cost per cr. Hr.**	**GU cost per cr. Hr.**	PERCENT of WSU CREDIT HOURS	PERCENT of TOTAL AA BUDGET
Academic Affairs	$85,020,652	$84,458,426	$169,479,078	161810	156020	317830	$533	**$268**	100.0%	100.0%
Fine Arts College	$6,560,155	$881,789	$7,441,944	12035	10486	22521	$330	**$291**	7.1%	4.4%
Engineering College	$7,031,890	$1,049,421	$8,081,311	14211	13934	28145	$287	**$250**	8.9%	4.8%
College of Education	$5,578,098	$202,241	$5,780,339	12723	12478	25201	$229	**$221**	7.9%	3.4%
Health Prof. College	$8,368,697	$4,770,648	$13,139,345	19386	19292	38678	$340	**$216**	12.2%	7.8%
Business College	$8,002,701	$3,638,564	$11,641,265	18864	18506	37370	$312	**$214**	11.8%	6.9%
LAS College	$24,231,870	$1,152,287	$25,384,157	84372	81198	165570	$153	**$146**	52.1%	15.0%
MSP	$3,678,422	$29,443	$3,707,865	14817	14396	29213	$127	**$126**	9.2%	2.2%