Fitchburg State University

Mathematics Department

Self Study Report

for the

Program Review – 2012

Approved by the Mathematics Department

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MATHEMATICS DEPARTMENT SELF STUDY REPORT – SPRING 2012

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DEPARTMENTAL OVERVIEW

1.   <u>History of the Department</u>

While mathematics courses had been taught at Fitchburg Teachers College since its founding in 1894-1895, it was during the 1950s and 1960s that the Massachusetts Legislature transformed the teacher colleges into comprehensive colleges, offering not only the several professional degrees, but also a full complement of liberal arts majors. Thus by 1970 Fitchburg State College offered a B.S. and B.A. in Mathematics as well as a B.S. Ed. in Secondary Education in Mathematics and enrolled over twenty majors per year. In summer 2010 the Massachusetts Legislature granted university status to most of the four-year state colleges. And in October 2010 our college officially became Fitchburg State University. Today at Fitchburg State University students in the mathematics program can pursue a Bachelor of Science in Mathematics, a Bachelor of Arts in Mathematics or a minor in mathematics and the Department also offers an Applied Mathematics concentration, Secondary Education concentration and a mathematics minor designed specifically for early childhood and elementary education students.

The Mathematics Department is organized under the *Agreement between the MSCA and the BHE (the Massachusetts State College Association and the Board of Higher Education)* which mandates the election of a chair every three years and two departmental standing committees, the Curriculum Committee and the Peer Evaluation Committee. The Department currently has four additional standing committees for which the departmental faculty members volunteer. These are the Assessment Committee, Elizabeth Haskins High School Mathematics Contest Committee, Seminar/Math Circles Committee and Hospitality Committee. In recent academic years this list has also included a Search Committee. Other ad hoc committees have been formed as needed. Examples of these are the Mathematics Readiness Program Committee, a Technology Committee, a Calculus Text Selection Committee, and this year's Self Study Steering Committee. The Department Chair along with the department secretary and the departmental committees take care of the business of the Department. The Department meets as a whole once a month. Since all faculty offices are in close proximity, faculty can and do communicate regarding day-to-day concerns and often can quickly resolve the minor issues that arise, through informal face-to-face communications and/or email.

During the last thirty years the Department of Mathematics has functioned both as a "service" department and a department with a viable undergraduate mathematics major program. An M.A.T. program in mathematics thrived during the late 1970s, was discontinued, and was reactivated in 1999 for another period of five years. Again it has been suspended for lack of interested students. Although the Department had either eleven or twelve faculty members for many years, during the period from approximately 2000 to 2010 it was staffed by nine or ten full-time members often with one of these members having a one-year temporary position. For academic year 2011-2012 the department again has ten tenure-track full time faculty members, a status it has been trying to achieve for several

years. Each semester there is also need for several adjunct faculty members and the department has been fortunate to have a few excellent and dedicated long-time adjunct faculty members. See the FACULTY DATA APPENDIX for more information.

In 2007, the Mathematics Department established a chapter of Pi Mu Epsilon, the national honorary mathematics society. Eight current students, 8 faculty members and 18 alumni have been inducted as members. Additionally the Department has an active mathematics club which sponsors various annual activities including speakers, problem solving sessions and social gatherings. In recent years many of our students have given presentations at conferences hosted by regional and national mathematical organizations. Our faculty members are professionally active in national and regional mathematics associations, in research, in the university and local communities, and in fostering student involvement in the mathematics community.

College policies and general governance of our academic workplace are determined by contract provisions and by proposals for change passed by the contractually established All College Committee (ACC) and approved by the President of the University. Faculty and librarian members of the ACC are annually elected by their colleagues to serve in this post. Administrators and students also serve on this committee. The Department traditionally has had at least one member on the ACC. One current member of the Mathematics Department has served as Chair of the ACC numerous times. Currently he and another department member serve on that committee. Two of the standing subcommittees of the ACC, the Curriculum Committee and the Academic Policy Committee also have traditionally had Mathematics Department faculty representation. Our Department members have also participated in nearly every campus-wide curriculum and accreditation effort and in various other campus-wide committee work or other initiatives. It was principally through the efforts of one of the newer members of the Mathematics Department that the University's Undergraduate Research Conference, now an annual program, was established in academic year 2009-2010. Two members of the Department served on NEASC college-wide subcommittees preparing for the University's upcoming visit and evaluation by the NEASC accreditation team. One faculty member served as co-chair of the NEASC Academic Program and Faculty subcommittee and another served on the Library, Information Technology and Financial subcommittee.

The defining characteristic of the Department and the major remains its devotion to its students and to high academic standards within service courses and major courses. The 2008 Academic Plan for the Mathematics Department, prepared at the request of the Office of Academic Affairs, expresses the Department's mission in the following way:

"The mission of the Department of Mathematics is to foster our students' self-reliance in mathematics, to produce graduates who can bring together the theory and practice of mathematics, and to create in graduates strengthened ability for critical and logical thinking."

Previous formal Program Reviews of the mathematics program at Fitchburg State were conducted in Spring 1983, Spring 2002, and Spring 2006. In Spring 1983, Dr. Thomas Kearns of Northern Kentucky University conducted an on-site review. In Spring 2002, Dr.

C. Edward Sandifer of Western Connecticut State University conducted a paper review. In Spring 2006, Dr. Ockle Johnson of Keene State University in Keene, New Hampshire conducted an on-site review. Dr. Johnson's report, together with the Department's response are in Appendix 1.1. A brief synopsis of departmental activities since 2006 associated with the Department's formal Action Plan and/or given impetus as the Department reflected on Dr. Johnson's report recommendations follows.

2. Major Recommendations for Improvement

Dr. Johnson's report following his site visit for the 2006 Mathematics Department Program Review did not include an itemized list of recommendations. The recommendations listed below are those identified by the Fitchburg State Associate Vice President of Academic Affairs based on her interpretation of Johnson's report. Each of ten identified recommendations is listed together with the Department's action or response to that recommendation.

2.1 Recommendation: *Establish a chapter of Pi Mu Epsilon Mathematics Honor Society at Fitchburg State.*

Departmental Response:

The Fitchburg State Math Club and the Mathematics Department had been working on this project prior to the 2006 program review. Fitchburg State's application was approved for the establishment of the Massachusetts Eta Chapter of Pi Mu Epsilon National Honorary Mathematics Society in the spring semester of 2007 and a formal initiation ceremony was conducted in October 2007 when thirteen (13) charter members were inducted, nine (9) students and four (4) faculty members. Six to seven new members have been inducted each year since.

2.2 Recommendation: *Establish additional mathematics courses for pre-service majors in early childhood/elementary/middle school, continue collaboration with the Education Department, and encourage faculty to attend PMET Conferences (Preparing Mathematicians to Educate Teachers).*

Departmental Response:

The Mathematics and Education Departments have continued their collaboration. Two new mathematics courses for the pre-service teachers which directly addressed the new mathematics frameworks defined by the Massachusetts Department of Education for approved licensure programs were developed. In addition a new three mathematics course requirement for all Early Childhood, Elementary and Special Education Majors at Fitchburg State was approved in Spring 2007 and took effect in Fall 2007. Since then the courses have been revised and continue to be refined, to best suit the needs of the students.

In Spring 2009 and Fall 2010, the Mathematics and Education Departments worked with Fitchburg Public Schools on a Department of Higher Education MPET (Mathematical Preparation of Teachers) STEM Pipeline fund grant that involved developing five (5) self-contained mathematics modules designed for use in courses for pre-service and in-service

teachers. These modules were to be made public by the BHE for use state-wide in teacher education programs and professional development programs for current teachers. In Fall 2010, the Mathematics Department, with the support of the Education Department, developed a special Mathematics Minor for Early Childhood, Elementary and Special Education Majors. It currently has seven students in it. In addition, the Mathematics and Education Departments have been working with local community colleges in an effort to align mathematics courses for pre-service students. The departments are currently collecting data on student scores from the mathematics subtest of the MTEL (Massachusetts Test for Educator Licensure) and plan to analyze this data in the future and use it to adjust the mathematics courses required of the education students if this is deemed necessary.

While no faculty members have been able to attend a PMET Conference, one faculty member who has been regularly teaching two of the three required courses for the pre-service teachers did take part in a similar conference in June 2011 sponsored by Boston University.

2.3 Recommendation: *Consider changing the sequencing of the upper level calculus courses to make calculus a smaller fraction of the required major coursework, but keep the labs for Calculus I and Calculus II.*

Departmental Response:

The Department believes the lab component of the Calculus I and Calculus II courses is a strong point of our calculus sequence and definitely plan to continue them. We have adjusted the Calculus III and Calculus IV courses so that they can be taken in either order to provide greater flexibility for student schedules. Also, when creating the new courses for the Applied Mathematics Track, calculus prerequisites were chosen carefully to allow for similar flexibility.

2.4 Recommendation: *Consider the use of Maple and Geometer's Sketchpad for appropriate courses.*

Departmental Response:

A *Maple* license was purchased in 2006 and the department has been using it since in the Calculus I and Calculus II labs. *(The Department had formerly used Derive software for these courses).* Some members of the department have also used *Maple* for Linear Algebra labs and in other courses. We have access to an old version of Geometer's Sketchpad but have not purchased a new one since it is not currently used on a regular basis by any of our faculty.

2.5 Recommendation: *Delete course listings from the catalog for courses not regularly offered.*

Department Response:

The Department proposed to remove the following courses from the catalog based on the fact that they have not been offered recently and there is no intention to offer them in the near future: MATH 1400 Mathematics Across the Curriculum, MATH 3100 Discrete Algebraic Structures, MATH 3600 Introduction to Mathematical Logic. Note that MATH 1400 and

3100 were previously required by other departments but are no longer required. MATH 3600 has not been offered since the 1980's.

2.6 Recommendation: *Develop other upper level mathematics courses.*

Department Response:

In Fall 2008, the Mathematics Department established an Applied Mathematics concentration involving three new courses – MATH 1850 Freshman Seminar in Applied Mathematics, MATH 3500 Methods of Applied Mathematics and MATH 4600 Senior Seminar in Applied Mathematics. MATH 1850 and MATH 3500 have successfully run and MATH 4600 will be offered for the first time in Fall 2012. An upper level Graph Theory course was offered as a topics course in Spring 2009 and may be offered again in the future. Linear Algebra II was offered as an independent study in Fall 2007 and Abstract Algebra II is was offered as an independent study in Fall 2011.

2.7 Recommendation: *Include Geometry in the mathematics minor for education students.*

Departmental Response:

The new three mathematics course requirement for all Early Childhood, Elementary and Special Education majors includes MATH 2000 Informal Geometry. Furthermore, the previously mentioned new Mathematics Minor for education students does include MATH 3000, the upper level Geometry course, in the choice of electives. (See. 2.2 above.)

2.8 Recommendation: *Implement the Outcomes Assessment Plan.*

Departmental Response:

The Mathematics Department Assessment Committee has developed rubrics and collected data for the technology, the oral presentation, and the proof reading and writing goals of our Outcomes Assessment Plan. Discussions by the committee have resulted in several faculty members making changes in the way they present assignments to students. See the CURRICULUM section under *Outcomes Assessment Plan* for more details.

2.9 Recommendation: *Increase library acquisitions in mathematics-related materials.*

Departmental Response:

The Mathematics Department continues to make recommendations to the Library for appropriate acquisitions. The Library has had increased funding recently and many appropriate volumes have been added to the mathematics collection. Some of our holdings are very old and need to be refreshed. See the Library subsection of the RESOURCES section for more details. We are in the process of ordering some new books to add to the collection and hope to keep doing this in future years to keep the collection up to date.

2.10 Recommendation: *Increase collaboration with the Director of the Placement Testing Center and Math Center.*

Departmental Response:

The Mathematics Department Chair collaborated with the Director of the Math Center in making the mathematics review/Accuplacer test prep program *Advancer* available to students with the aim of providing sufficient review to help students pass the Accuplacer Elementary Algebra Placement Test. In 2009 the Math Center collaborated with select members of the department to offer special tutoring sessions for those students in the mathematics classes required for the education majors. More recently, some members of the department have reviewed the MyMathTest program for the purposes of possibly using it in the Math Center for online mathematics remediation and preparation. That topic will be further investigated during in the future. The Chair of the Mathematics Department has a meeting with the Math Center Coordinator at least once a year to discuss Math Center data, any Accuplacer Placement Test concerns and exchange new ideas. Recently the Department submitted a proposal to governance to allow students to take get into Calculus I by obtaining a certain score on the College Level Accuplacer. This will give students who took pre-calculus in high school an opportunity to go directly into Calculus I at Fitchburg State. The Math Center Coordinator (who is also the Testing Coordinator) supported this plan. Fitchburg State has not previously administered the College Level Accuplacer Test.

3. Best Practices for Mathematics Departments

The Mathematical Association of America's Committee on the Undergraduate Program in Mathematics (CUPM) has been studying the curriculum of undergraduate mathematics majors in the U.S. since 1953. The CUPM reports are considered to be a primary source for "best practices" in the teaching and design of undergraduate mathematics programs and courses in this country. The most recent report was 2004. There were six recommendations made in *Undergraduate Programs and Courses in the Mathematical Sciences: CUPM Curriculum Guide 2004* (available at www.maa.org/cupm/), which will be examined in the following sections. In addition, there was a recommendation for Pre-service K-6 and middle school teachers that will be addressed in section 3.7.

3.1 Recommendation 1
Mathematical science departments should
- *Understand the strengths, weaknesses, career plans, fields of study, and aspirations of the students enrolled in mathematics courses;*
- *Determine the extent to which the goals of courses and programs offered are aligned with the needs of students as well as the extent to which these goals are achieved;*
- *Continually strengthen courses and programs to better align with student needs, and assess the effectiveness of such efforts.*

The members of the Mathematics Department have good contact with alumni and many in the department have been cited by current students as being very approachable. There is a constant stream of current students seeking help from their professors and using the computers in the Mathematics Department area of E301. The newly renovated offices, especially the facilities for adjunct faculty, have supported this. The small number of advisees per faculty member allows for good personal contact between advisor and advisees.

Some of our incoming mathematics majors are not really prepared for, or committed to, a mathematics major. So an important part of advising has been to help students find their best choice of major. It is also not unusual for informal conferences to develop between an instructor and an advisor concerning a particular student. If a certain mathematics major needs a collective "push" to achieve excellence, the department collaborates to help the student. So there is a good departmental knowledge of strengths, weaknesses, career plans, fields of study, and aspirations of the students enrolled in mathematics courses. As described in the Mathematics Department Academic Plan:

"We stay abreast of the needs of our students as a whole as well as of individual students and their goals. Whether our students' goals are to teach, attend graduate school, get a job in a mathematics field after graduation, or use mathematics as a foundation for logical thinking to step into another career path, our goal is to support our students in their endeavors. This involves not only providing these students with the knowledge they need to succeed in their specific goals, but also fostering a sense of belonging on campus and to the mathematics community as a whole."

See Appendix 1.2 for the entire Mathematics Department Academic Plan.

The Assessment Committee of the department has been busy creating rubrics for assessing various portions of the Outcomes Assessment plan. The assessment process has started for some objectives. In addition, the process has brought the department to adopt "best practices" guidelines for student homework assignments, proofs and lab reports. In terms of curriculum, the Mathematics Department continually re-assesses the two year plan of offerings of upper-level mathematics courses to meet the needs of current mathematics majors. The current scheduling plan can be found in the CURRICULUM section under *Mathematics Department Courses*. Even with this rotating schedule, it is difficult to keep upper level electives running, due to low enrollment. The Department continues to lobby for these electives to run so that students can get the courses they need to graduate. The new Applied Mathematics concentration was implemented as a result of studying interests of majors and the job market. It offers an interdisciplinary option for the students and helps prepare them for a career in industry.

The Department is also very dedicated to its non-major curriculum and the students it serves. The new MATH 2100 Technical Calculus was invented in response to the need of architecture students, who were failing Calculus I. The new mathematics requirements for K-6 education majors was the result of studying recommendations for best practices in pre-service teacher education (see section 3.7 below), new requirements by the Commonwealth of Massachusetts and in-depth conferences with members of the Fitchburg State Education Department and outside constituents affiliated with the local public schools. There have also been recent discussions of what might be done for education students who fail the Arithmetic Accuplacer but pass the Algebra Accuplacer. This discussion was the direct outgrowth of the sabbatical work of one member of the department. In addition, there have been several revisions of the core curriculum for these courses for education majors.

For more details on curriculum and assessment, see the CURRICULUM section.

A formal outside review of the Readiness Program in 2008 validated the approach of the department to mathematics readiness, in spite of opposition to the current approach by the former Vice President for Academic Affairs. The corresponding report can be found in Appendix 1.3. A recent investigation of the establishment of a Fitchburg State site for MyMathTest created by the Pearson Education Co. has been carried out by another department member on sabbatical. The intent is to help students prepare for certain classes or licensure exams. For example, a student could complete a module on trigonometry before entering Calculus I, or polish up on algebra before taking the Algebra Accuplacer, Introduction to Functions or Precalculus. It could also be used to help students practice for the Massachusetts Tests for Education Licensure (MTEL). This plan needs monetary support by the Administration, since it involves substantial faculty work in setting up the site.

3.2 Recommendation 2

Every course should incorporate activities that will help all students progress in developing analytical, critical reasoning, problem-solving, and communication skills and acquiring mathematical habits of mind. More specifically, these activities should be designed to advance and measure students' progress in learning to

- *State problems carefully, modify problems when necessary to make them tractable, articulate assumptions, appreciate the value of precise definition, reason logically to conclusions, and interpret results intelligently;*
- *Approach problem solving with a willingness to try multiple approaches, persist in the face of difficulties, assess the correctness of solutions, explore examples, pose questions, and devise and test conjectures;*
- *Read mathematics with understanding and communicate mathematical ideas with clarity and coherence through writing and speaking.*

As can be seen by a perusal of the Mathematics Department Outcomes Assessment Plan (see Appendix 1.4), the above are covered in the primary goals of the Mathematics Department. In particular, two goals of the plan are:

Goal 2: Each undergraduate mathematics major, upon graduation from Fitchburg State University, should be able to apply mathematics to a broad spectrum of complex problems and issues by formulating and solving problems.

Goal 3: Each undergraduate mathematics major, upon graduation from Fitchburg State University, should be able to read, write, listen, and speak mathematically, as well as to be able to read and understand technically-based materials and to contribute effectively to group efforts.

While particular methods of teaching cannot be legislated due to issues of academic freedom, the philosophy of all members of the department support these goals. In particular, the department did specify that the Informal Geometry course be taught using the discovery method and that the Informal Number Theory and Informal Mathematical Modeling courses be taught using an interactive, group work approach as much as possible as well as stressing multiple representations and approaches to problems. These are the required courses for K-6 pre-service teachers. Approaches used by members of the department include quizzes based on reading assignments, precise writing stressed in proofs and lab reports, oral presentations in the mathematics seminar and other upper level courses, and group projects.

3.3 Recommendation 3

Every course should strive to

- *Present key ideas and concepts from a variety of perspectives;*
- *Employ a broad range of examples and applications to motivate and illustrate the material;*
- *Promote awareness of connections to other subjects (both in and out of the mathematical sciences) and strengthen each student's ability to apply course material to these subjects;*
- *Introduce contemporary topics from the mathematical sciences and their applications, and enhance student perceptions of the vitality and importance of mathematics in the modern world.*

Again, issues of academic freedom forbid legislating certain approaches to teaching courses. However, the Outcomes Assessment Plan and the Academic Plan of the Mathematics Department support these recommendations. They are reflected in the general philosophy of all members of the department, which affects how each professor teaches his/her courses.

The recent establishment of the Graph Theory course introduces some more contemporary mathematics into the mathematics major. Some professors who teach Number Theory include some crypto-analysis. Some professors who teach Linear Algebra include applications to computer graphics. Some professors who teach the Informal Geometry course include fractals as a topic. In addition, students undertaking independent study sometimes choose more contemporary topics, such as cryptography.

The Applied Mathematics concentration requires a minor in another field and a capstone project, which definitely involves applications of mathematics to other fields. The new Liberal Arts and Sciences (LAS) requirements encourage a minor in another field by giving an option that involves a cluster of courses in a single discipline outside the student's major. This helps encourage more mathematics majors to minor in computer science, business, biology, chemistry or some other field.

3.4 Recommendation 4

Mathematical sciences departments should encourage and support faculty collaboration with colleagues from other departments to modify and develop mathematics courses, create joint or cooperative majors, devise undergraduate research projects, and possibly team-teach courses or units within courses.

The Mathematics Department has had extensive collaboration with the Education Department over a period of years to establish the three required mathematics courses for K-6 pre-service teachers. These discussions have been ongoing, with revisions in the core syllabi of the courses as a result. Discussion with the Industrial Technology Department led to the creation of the Technical Calculus course for architecture majors. The creation of the Applied Mathematics track involved discussion with the various science departments.

A member of the department used a grant to involve some undergraduates in research on magic squares. This has led to student presentations at national mathematical meetings. Two

students under his supervision are also presenting work that was the outgrowth of a class assignment at the AMS-MAA Joint meetings in Boston. Another member of the department encouraged a team of students to solve problems in the journals *American Mathematical Monthly* and *Math Horizons*. Some of their submitted solutions were published. The same faculty member inspired students to do original research in the mathematics seminar. Some of this carried over to joint work with a single student that was presented at a recent AMS-MAA Joint meeting. A third member of the department received a grant to support a Math Circle at the Fitchburg Arts Academy, a local middle school, and has since involved students in assisting with this project.

Unfortunately, lack of current support for team-teaching and the retirement of one member of the department caused the demise of team-teaching in Biomechanics and in two Leadership Academy courses. However, Informal Number Theory was team-taught by a member of the Mathematics Department and a member of the Education Department.

3.5 Recommendation 5
At every level of the curriculum, some courses should incorporate activities that will help all students progress in learning to use technology
- *Appropriately and effectively as a tool for solving problems;*
- *As an aid to understanding mathematical ideas.*

Virtually all members of the Mathematics Department incorporate the use of technology in their courses, where appropriate. Fitchburg State supports the use of Excel, PowerPoint, Maple, Matlab and Minitab. Labs using Maple are a required part of Calculus I and II. Linear Algebra is regularly taught with computer assignments using Matlab or Maple. Most professors of Applied Statistics give class assignments using Minitab or Excel. Some Precalculus and Functions courses have graphing calculator assignments or Excel assignments. Excel and other programs have been used in Finite Mathematics. Technology assignments are regularly used in applied mathematics courses, Operations Research, Probability and Statistics and other upper level courses.

Many members of the department use MyMathLab for online assignments in lower-level mathematics courses and others use WebWork and Hawkes Learning System.

3.6 Recommendation 6
Mathematical science departments and institutional administrators should encourage, support and reward faculty efforts to improve the efficacy of teaching and strengthen curricula.

During the evaluation process, members of the Peer Evaluation Committee and the department chair regularly recognize the work of members of the department in the area of improving the efficacy of teaching and the strengthening of curricula. Positive feedback and encouragement is given for using a variety of effective teaching techniques such as group work, discovery based learning, student presentations and reading/writing assignments. Many of our faculty members have implemented these techniques in their classes with much success.   Department members have also received a variety of grants to support their

teaching innovation. In 2006, the Department was awarded a grant to purchase a document camera that has since been used to display student work in mathematics courses for future teachers. More recently Academic Affairs has instituted grants that can be used for assessment or curriculum development. Some of the newer members of the department have been successful in obtaining these grants. In particular, two such grants were awarded to department members to assess and rewrite labs for Calculus I and II. In addition, the Department and University have purchased wireless tablets for use in the classroom and in online courses. Several of the Mathematics Department faculty members have made use of these in their teaching. The University as a whole is experimenting with the use of clickers and has provided training sessions for the use of these and other devices in the classroom. The technology budget of the Department has been increased over the past few years to accommodate the expanding use of technology. There still is a need for specific support from Academic Affairs for the development of some projects that the Department would like to pursue. For example the aforementioned MyMathTest project to assist with mathematics remediation and a project that would use WebWork to program MTEL practice problems to be put online.

3.7 Recommendation for Pre-service Elementary and Middle School Teachers
Mathematical sciences departments should create programs of study for pre-service elementary and middle school teachers that help students develop
- *A solid knowledge—at a level above the highest grade certified—of the following mathematical topics: number and operations, algebra and functions, geometry and measurement, data analysis and statistics and probability;*
- *Mathematical thinking and communication skills, including knowledge of a broad range of explanations and examples, good logical and quantitative reasoning skills, and facility in separating and reconnecting the component parts of concepts and method;*
- *An understanding of and experience with the uses of mathematics in a variety of areas;*
- *The knowledge, confidence, and motivation to pursue career-long professional mathematics growth.*

The current mathematics requirements for K-6 pre-service teachers more than meet these requirements. Fitchburg State has a very strong requirement of three rigorous, in-depth mathematics content courses required of all Early Childhood, Special Education and Elementary majors which cover all the topics outlined above with the exception of probability. A serious problem is keeping this requirement in the face of pressure from outside sources to accept the transfer of credit from community colleges with "mile wide and inch deep" courses. However, the department has been working on getting local community colleges to align their pre-service courses with ours and has been successful in doing so with some institutions.

Middle School mathematics pre-service teachers at Fitchburg State now have to be mathematics majors and receive dual certification in Middle School and Secondary Mathematics. So the requirement for them also is far greater than the minimum recommended in the CUPM report.

4. Departmental Initiatives and Significant Changes in the Past Five Years

The Mathematics Department outlined a list of 'recommendations for change' as a part of its 2006 Self Study. Several of those plans for change overlap the recommendations made by the 2006 reviewer, Dr. Ockle Johnson, and are mentioned in Section 2 above (items 2.4, 2.6, 2.8). Very briefly, the 2006 department's plans for change involved future faculty hires, department web page upgrades, working to better implement some of the CUPM standards, adjusting to the laptop initiative, study of the remediation program, upgrading our mathematics software to Maple10, introducing a course in graph theory, implementing our Outcomes Assessment Plan and working to recruit mathematics majors. The following list of new initiatives and changes for the Department during the last five years indicates that the Department has done well in accomplishing those 2006 plans. Indeed, with some of our new faculty hires leading the way, we have met those challenges and made other significant advancements also.

Listed below are significant departmental changes and accomplishments completed since our 2006 Program Review.

4.1. **New Department Offices**: In AY 2010-2011, the Mathematics Department moved to newly remodeled offices in Edgerly Hall. Each faculty member now has a private office with offices and a Seminar Room clustered along the perimeter of the 3rd floor. The Chair of the Computer Science Department is also located in this region. A secretary's station for both the Computer Science Department and the Mathematics Department is located in the interior of the space, together with office equipment and materials used by both departments' faculty. An inviting foyer area with lounge chairs and one classroom is also included. The classroom and part of the remaining space is intended as offices for the computer science faculty in the next stage of the renovation project. This is a major upgrade from the Mathematics Department's previous headquarters. Faculty and students have greatly benefited from this relocation.

4.2. **Staffing Changes**: Three new tenure track faculty have been added to the department. Dr. Peter Staab joined the department in AY 2006-2007. Dr. Jennifer Berg came on board in AY 2008-2009, and Dr. Bruce Romano, who had been with the department as a one-year temp for both AY 2009-2010 and AY 2010-2011, moved into a tenure track position for the current academic year. Two retirements also took place, with Mr. Robert Bentley retiring in Spring 2007 and Dr. Christine Cosgrove doing so in Spring 2009. There are now ten full-time tenure track faculty.

The Mathematics Department has a new Chairperson, Dr. Mary Ann Barbato, since AY 2009-2010. Dr. Amy Wehe was granted tenure, Dr. Peter Staab was promoted to the rank of Associate Professor, Dr. Mary Ann Barbato was granted tenure and promoted to the rank of Associate Professor, and Drs. Mark Snyder and Claire McAndrew were promoted to the rank of Full Professor.

4.3   Curriculum Changes: A number of curricular changes occurred recently. These include:

- A new track within the mathematics major in Applied Mathematics was approved in Spring 2008. Three new courses were designed for this program – Math 1950 Freshman Seminar in Applied Mathematics (a one-credit course), Math 3500 Methods in Applied Math, and Math 4600 Senior Seminar in Applied Mathematics. The latter two courses are three credit courses. The first complete cycle of the program should be implemented by Fall 2012.
- A new three mathematics course requirement for all Early Childhood, Elementary and Special Education students was approved. The courses are Math 1500 Informal Number Theory, Math 1600 Informal Mathematical Modeling, and Math 2000 Informal Geometry. The first two of these are newly designed courses.
- A new mathematics minor was defined for education majors.
- A new course Math 2100 Technical Calculus was designed primarily for the architecture students in the Industrial Technology Department.
- A graph theory course was offered as a topics course in Spring 2009.

4.5   Co-curricular Changes:

- The Math Club, with the encouragement and support of its advisor and other faculty members, has become much more active in sponsoring mathematical talks on campus, in forming 'problem solving' sessions, and in serving as 'mentors' to new first year mathematics majors.
- Students have become involved in research projects and formal presentations of their work both as part of class work and through an in-college research grant. Many students over the last several years have made presentations at the Fitchburg State Undergraduate Research and Creative Arts Conference, MAA Math Fest, Northeast Section MAA meetings, Hudson River Undergraduate Research Conferences, and at the MAA Undergraduate Poster Session at the Joint Mathematics Meetings of the MAA and AMS. Faculty have supported and encouraged students in these endeavors.
- One faculty member has worked with students on "Problems of the Day" involving students in some fun and challenging mathematics problem solving. This same faculty member put together a team of students to participate in the Putnam competition in 2011 and is also considering developing a one credit course to help students prepare for such competitions in the future.

4.5   Software and Technical Support: Improvements in software and technical support continues for offices and classrooms. The Department received a new printer/copier/scanner last year which has much greater versatility than did the previous copier. The phone system has also been upgraded. New versions of *Maple* and *Minitab* have been licensed. The current licenses allow students to have these programs on their own laptops and this greatly facilitates the ability of faculty to make assignments that require the use of these technologies. Some wireless tablets and clickers have been purchased by the University and they are currently being used

by several faculty members. The department web page was recreated by one of our faculty members a few years ago. Since then the University has converted to a new website which became live in Fall 2011.

4.6   **Mathematics Readiness Program**:   A new college policy exempts students transferring to Fitchburg State from another Massachusetts state institution of higher education, from the Fitchburg State Mathematics Readiness Requirement, if the student had previously satisfied the similar requirement at the institutions from which they are transferring. The Mathematics Department was not in favor of this policy change, which was proposed without any input from our Department or any other academic department on campus. We are attempting to monitor the success rate in mathematics courses for the students for whom this exemption applies.

The Mathematics Readiness Program underwent a formal program review conducted by Ms. Christina Gundlach, coordinator of the Math Center and Developmental Program at Central Connecticut State University.   The review was generally positive. The reviewer supported continuing the Basic Mathematics I requirement for students testing at this level but there has been no support for that by Academic Affairs. See Appendix 1.3 for the full report.

5.   Centrality of Department Programs to the Mission and Vision of the University

The mission statement of Fitchburg State University reads:

Fitchburg State University is committed to excellence in teaching and learning and blends liberal arts and sciences and professional programs within a small college environment. Our comprehensive public university prepares students to lead, serve, and succeed by fostering lifelong learning and civic and global responsibility. A Fitchburg State education extends beyond our classrooms to include residential, professional, and co-curricular opportunities. As a community resource, we provide leadership and support for the economic, environmental, social, and cultural needs of North Central Massachusetts and the Commonwealth.

The core values of the University as given on its website are *accessibility, affordability community, enrichment, and excellence.*

The mission of the Department of Mathematics is to foster our students' self-reliance in mathematics, to produce graduates who can bring together the theory and practice of mathematics, and to create in graduates strengthened ability for critical and logical thinking.

The Mathematics Department advances the mission of the University by providing to Fitchburg State students the best possible programs it can deliver for all of the department's constituencies – the mathematics major program (including concentration options in applied mathematics and secondary education), the post-baccalaureate program leading to initial licensure as a secondary education teacher of mathematics, the traditional mathematics minor, the mathematics minor designed for the early childhood, elementary, and special

education students, the mathematics service courses for students in disciplines which require particular quantitative knowledge and skills, the mathematics courses which satisfy graduation requirements of the Liberal Arts and Science Program, and the developmental mathematics program designed for students needing further preparation for college level mathematics.

The Mathematics Department supports the mission of the College in several ways:

a) The Department has offered a traditional mathematics major which has compared favorably with majors at other liberal arts and comprehensive colleges. In addition to the calculus computer labs, the department initiated a Mathematics Seminar for mathematics majors in which students demonstrate writing and speaking skills in the study of problem solving and research on one or more topics outside the usual curriculum. Writing has become a part of many mathematics courses.

b) The mathematics offerings for the professional majors are considerable and have been continually re-evaluated. A list of service courses offered for particular majors can be found in the CURRICULUM section under *Mathematics Requirements for Other Majors*.

d) The Mathematics Department consistently attempts to keep an appropriate focus on mathematics content through the offerings of courses that are appropriate and up-to-date for the many different major programs it serves, and for its own mathematics majors.

e) The Elizabeth Haskins Mathematics Contest for area high school students has been an annual event for thirty years. Approximately 500-600 students have come to this event each year to compete for prizes, listen to talks on a variety of mathematical topics, and visit the campus.

f) One mathematics faculty member initiated a Math Circle program with the Fitchburg Arts Academy middle school on campus and was awarded a grant through the Dolciani Foundation under the Mathematics Association of America to help fund this undertaking. She has also been awarded an in-college grant to fund 1-3 Fitchburg State University students to help her with the Math Circle in spring 2012.

g) Mathematics and education department faculty members have collaborated with faculty and administrators from Fitchburg Public Schools or Leominster Public Schools to help develop the mathematics curriculum and/or develop mathematical modules for use in teacher education programs for either current mathematics teachers or pre-service teachers.

6. __Program Structure__

The Mathematics Department serves all students at the University. Mathematics majors receive a comprehensive foundation in abstract or applied mathematics as preparation for graduate studies or for a professional career. Minors in mathematics receive the mathematical foundation needed for advanced work in their major field. The Department also provides all students with courses for their major or with courses to fulfill the requirements of the Liberal Arts and Sciences Program.

Mathematics students may pursue:
- A concentration in a 'traditional' Mathematics program (analysis, algebra, geometry, number theory, and selected 'applied' fields).
- A concentration in Applied Mathematics (operations research, mathematical modeling, numerical analysis, graph theory, probability and statistics).
- Initial licensure as a high school mathematics teacher (a mathematics major program which includes geometry, number theory, probability and statistics, pedagogy, and practicum in a secondary school setting).
- One of two minor programs in mathematics (one of these is a general program and one is designed for the Early Childhood, Elementary, and Special Education majors).

The Bachelor of Science or Bachelor of Arts in Mathematics 'traditional' major program is comprised of 42 credit hours of course work. Twenty-four (24) of those required credit hours are for specified mathematics courses, three (3) are for a required course in computer science, and for the remaining fifteen (15) credit hours students may choose any five courses from among the 3000 and 4000 level mathematics electives offered, at least three of the electives chosen must be at the 4000 level. All upper level mathematics electives are 3-credit hour courses.

The Bachelor of Science in Applied Mathematics is comprised of 39 credit hours of course work in mathematics and 3 credit hours for a required computer science course. Requirements mirror those of the 'traditional' program described above with twenty-one (21) of the required credit hours identical to those of that program. Nine (9) additional credit hours for mathematics courses are specified with a choice of 12-credit hours (or four courses) in mathematics electives. At least three of these elective course must be at or above the 3000 level. In addition the program requires eight (8) credit hours in General Physics I and II and also requires a minor in biology, chemistry, computer science, economics, geography/earth science, or psychology. The program is designed to provide students with a strong mathematical background and an emphasis in a second field in which the student can integrate his/her mathematical knowledge.

The Bachelor of Science in Mathematics with Initial Teacher Licensure program is structured similarly to the 'traditional' mathematics major program described above with both an exception to the number of 'free' electives and with an add-on of course work designed to introduce students to theories and practices in secondary education. The mathematics portion of this program has two additional 'required' mathematics courses (Math 3000 Geometry and Math 4200 Probability and Statistics I). Hence the 'free' upper level mathematics electives are reduced in number to three (3), at least two (2) of which must be at the 4000 level. Four

(4) additional 3-credit hour courses in educational theory and practice, including a special course in methods of teaching secondary school mathematics are required. In addition, two 150-hour practicums in a secondary school are required.   Students who successfully complete this program are awarded the Initial Teacher Licensure as a high school mathematics teacher in the state of Massachusetts. This program also has NCATE certification.

The post-baccalaureate secondary education program is designed to provide the student who has already earned a Bachelor's degree an avenue to acquire the Massachusetts' Initial Teacher Licensure as a secondary education mathematics teacher. The program requirements mirror those of the corresponding program for undergraduate students.

The 'traditional' minor in mathematics is composed of twenty-three (23) semester hours of mathematics courses, consisting of eight (8) credit hours in calculus, three (3) in either Linear or Abstract Algebra, and twelve (12) credit hours of mathematics electives. The electives must satisfy particular requirements with respect to course level and type of course. The level of mathematical attainment in this mathematics minor program is approximately equal to one half that in the mathematics major program.

The mathematics minor for Early Childhood, Elementary, or Special Education majors is a 21-23 credit hour program which includes seven 3 or 4-credit hour courses in mathematics. It is designed to integrate the three mathematics course requirements for all education majors into a program that gives the student a basic understanding of those concepts in higher mathematics that have special relevance to the mathematics taught in the elementary classroom.

7.   <u>Interdisciplinary Programs</u>

The Applied Mathematics concentration is an interdisciplinary program in that it requires the student to have a minor in a discipline that uses mathematics, and has a program requirement that the student complete a mathematically-related research project on a topic from the minor field of study. Ideally this project will be directed by both a supporting faculty member from the department in which the minor is offered and a faculty member from the Mathematics Department.

The three mathematics course requirement for Early Childhood, Elementary, and Special Education majors, while not a formal interdisciplinary program, is a program in which the Mathematics and Education Departments expect to have continued collaboration.

THE FACULTY

The full-time mathematics faculty members have varied backgrounds and academic interests. The gender split of the faculty is right down the middle with five women and five men. One of the faculty members is African American and the background of the others represents a broad geographic distribution of the U.S. Since the last review, we added three (3) members to our faculty which has brought new ideas and interests. The research interests of the faculty include graph theory, mathematics education, analysis, statistics, number theory, applied mathematics, linear algebra, abstract algebra, magic squares and math circles. Many of the faculty members regularly attend national mathematics conferences with some having recently given presentations at these conferences, and are involved in various other professional development activities. There is a strong focus across the faculty on undergraduates, with a faculty supervised math-club, faculty organized "problem of the week", faculty guided research and general close contact with mathematics majors. Other activities of the faculty include heading the Massachusetts Eta Chapter of Pi Mu Epsilon, running a math circle at a local primary school, directing the Fitchburg State Center for Teaching and Learning, and extensive committee work for Fitchburg State. More details are categorized in the sections below and can be found in the FACULTY DATA APPENDIX which includes a complete list of the faculty members and their resumes.

The Department also employs several part-time faculty members each semester and has been fortunate to have a few excellent and dedicated long-time adjuncts. The adjunct faculty members teach all of our developmental mathematics course sections as well as some service course sections each semester. The developmental courses have common texts, syllabi and exams but for non-developmental courses, the instructors have full responsibilities, including choosing their own text. Many of them give useful input on the courses they teach as well as departmental policies. The resumes of our current adjuncts are included in the FACULTY DATA APPENDIX.

1.   Faculty Teaching Activities

Faculty full-time teaching responsibility consists of four three-credit courses per semester. This may vary depending on alternate assignments that include course releases (e.g. chair). At least three-quarters of the sections taught in each semester are devoted to service courses. Hence, each faculty member typically gets one mathematics major course and three service courses to teach in any given semester. Because our Calculus I and Calculus II sections are four-credit courses and the seminar courses are one-credit courses, several of our faculty routinely carry overloads and hence are compensated at a later time with a one course reduction.

The Mathematics faculty members are generous in doing independent/directed studies with students. The directed study option for students occurs when an upper level elective (or required) course is cancelled due to low enrollment or a student wants to take an upper division course that is not offered on a regular basis. For especially capable students who have expressed interest in graduate study in mathematics, the student's advisor or another faculty member often suggests an independent study course in a topic of interest to the student that is not offered in our usual curriculum or a rigorous second-level course in algebra, analysis, or another related topic. These activities are indicative of the support and encouragement departmental faculty try to extend to our students. These extras are especially notable because this work yields very little compensation. (For a 3-credit directed or independent study course a faculty member is compensated at the rate of ¼ -credit per student.) Recent independent and directed studies include: Abstract Algebra, Abstract Algebra II, Linear Algebra II, Topology, Calculus IV and History of Mathematics. One of our faculty members has a background in physics and has recently offered an independent study in Classical Mechanics and plans to offer one in Intermediate Electricity and Magnetism in spring 2012.

Many of our faculty members have created and taught new courses recently, including those for the Applied Mathematics Concentration and those for education majors. See section 3 for more details on these courses. One of the new faculty members developed and taught the department's first college-level online course, Precalculus, in summer 2007 and set the stage for future online courses. (An on-line section of *Math 0200* Basic Mathematics II, a developmental course, had been taught twice several years ago.) Since then, other faculty members have successfully taught Applied Statistics online for Nursing majors as well as Business Statistics and Business Calculus as part of an online Bachelor's degree program in Business Administration.

2.   <u>**Faculty Research, Outreach and Professional Activities**</u>

Our faculty members are very active outside of teaching. Since the last review, our faculty members have collectively given numerous presentations at local, national and international conferences. Many have also attended professional development workshops, participated in grant activities and organized mathematics activities with the local public schools.

Our newest faculty member received a grant to collect assessment data in TK-20 and also participated in a WebWork Consultant Training Session this past summer. He will be conducting two outreach WebWork workshops within the next couple of years as part of his post training activities. Our next newest faculty member is very active in the areas of Assessment and Mathematics Education and has attended corresponding workshops and given several presentations. She has already contributed a great deal to these fields at the department level, the university level and beyond and is currently leading a learning community that involves other Fitchburg State faculty members and a local high school.

This learning community was formed as a *Critical Friend's Group* which is a component of the *School Reform Initiative*. For more information see http://schoolreforminitiative.org/protocol/lce.html. Our other new faculty member has been particularly active in undergraduate research and has successfully engaged six (6) of our students over the past few years in original research on Magic Squares. He also sponsored these students to give talks and poster sessions at conferences and has written a manuscript for publication with them. Another faculty member has recent publications in the area of Combinatorial Matrix Spectral Graph Theory and has met with individuals across the nation to collaborate. She recently gave a related talk at the *2011 ILAS Conference on Pure and Applied Linear Algebra: The New Generation* in Braunschweig, Germany and also organized a mini-symposium at this conference. In addition, two of our faculty members have written manuscripts to serve as texts in classes they teach. In the past five (5) years, our department has collectively received both internal and external grants for the following activities: assessment, research, math circles with the local schools and professional development for teachers. Another outreach activity is the annual Elizabeth Haskins Mathematics Contest which our department has been hosting for over 25 years. For this event, we bring in 500 to 600 local high school students for a problem solving contest, mathematics talks given by our students and other activities.

Since the last review our department has been granted seven (7) sabbaticals, five (5) of which have been successfully completed, one of which is still in progress and one which is scheduled for Fall 2012. Also during this time, two of our members were awarded tenure, two were promoted to Associate Professor and one was promoted to Full Professor. This year three of our faculty members have submitted portfolios for personnel action – one for tenure, one for promotion to associate professor and one for promotion to full professor. All of their evaluations have been positive thus far. Other awards received by members of our department in the past five years include the Harrod Lecture Award, Mara Teaching Award and Undergraduate Research Award. More details related to the research, publications, invited presentations by our faculty and other scholarly pursuits, including on-campus activities, are contained in their individual resumes in the FACULTY DATA APPENDIX.

3.   Faculty Involvement in University Communities and Service

The mathematics faculty has been well represented on university-wide committees and various special purpose task forces and many of them contribute more than their share of time and talent to university initiatives and departmental projects. Just a few examples are highlighted below.

One of our new members took on the role as chair of our departmental assessment committee in her first year and has been making great progress ever since. More details can be found in the Outcomes Assessment Plan subsection of the CURRICULUM section. Our faculty have also contributed a great deal to curriculum development since the last review, including but not limited to, the development of a new applied mathematics concentration and a new

mathematics minor designed for education students. In addition, our department has a well-supported active Math Club and a chapter of Pi Mu Epsilon National Mathematics Honorary Society. The faculty advisors of these organizations assist in activities such as seminars, conferences, problem solving sessions, and social gatherings.

Two of our faculty members co-directed the University's Center for Teaching and Learning for the academic years 2009-2010 and 2010-2011. One of those faculty members also organized the first and second Annual Fitchburg State Undergraduate Research Conference and is now working on the 2012 conference scheduled for April. Our faculty members have regularly served on and chaired university-wide committees including the All College Committee (ACC), ACC Curriculum Committee, ACC Academic Policies Committee and the Technology Advisory Committee. More recently, two of our newer members served on NEASC subcommittees and put in countless hours helping the University prepare for this very important review. One of our faculty members has been heavily involved in university-wide assessment and has given invited presentations at NEEAN (North East Education Assessment Network) conferences.

In summation, our departmental faculty members are a diverse and active group. They are student-oriented, show loyalty to the University, and are true professionals dedicated to their teaching, service, and continuing scholarship roles.

CURRICULUM

1. <u>Program Objectives</u>

The mission of the Department of Mathematics is to foster our students' self-reliance in mathematics, to produce graduates who can bring together the theory and practice of mathematics, and to create in graduates a strengthened ability for critical and logical thinking.

The Mathematics Department advances this mission by providing to Fitchburg State University students the best possible programs it can deliver for:
- The mathematics major program
- The mathematics major leading to initial licensure as a secondary education teacher of mathematics
- The mathematics major with a concentration in Applied Mathematics
- The post-baccalaureate program for initial licensure as a secondary education teacher of mathematics
- The mathematics minor program
- The mathematics minor program for Early Childhood, Elementary and Special Education students.
- The mathematics service courses for students in disciplines which require particular quantitative knowledge and skills
- The mathematics courses which satisfy graduation requirements of the Liberal Arts and Science Program
- The developmental mathematics program designed for students needing further preparation for college level mathematics.

While each of these components has a somewhat different purpose and objectives, the all-encompassing goal of the Department of Mathematics is to provide Fitchburg State students with the best possible teaching and learning environment, to ensure the academic integrity and academic quality of all mathematics programs and individual courses, and to actively encourage the academic growth and success of all students. The Department of Mathematics serves all students at the University. Mathematics majors receive a comprehensive foundation in abstract and applied mathematics as preparation for a professional career or for further study. Minors in mathematics receive the mathematical foundation needed for advanced work in their major fields. Other students receive instruction in the quantitative theory and skills appropriate for their chosen disciplines. The hope is that all students also receive an appreciation of mathematics as an intellectual endeavor.

The Bachelor of Science or the Bachelor of Arts in Mathematics major program is designed to provide the student with a comprehensive foundation in abstract and applied mathematics and an appreciation of mathematics as an intellectual endeavor. The program is designed to provide the mathematics majors with maximum career flexibility including options for graduate study or for careers in areas such as technology, statistics, engineering, law, business, finance, actuarial science and operations research.

The Bachelor of Science or Bachelor of Arts in Mathematics with Initial Teacher Licensure program is designed to provide mathematics majors with an opportunity to teach mathematics at the secondary school level, grades 8 – 12. Students who successfully complete the program are awarded the Initial Teacher Licensure as a high school mathematics teacher in the state of Massachusetts.

The Bachelor of Science or Bachelor of Arts in Mathematics with Applied Mathematics Concentration program is designed to provide mathematics majors with an opportunity to integrate mathematics into another field of study. Students who complete this program will have a strong mathematical background as well as an emphasis in a second field.

The post-baccalaureate secondary education program is designed to provide the student who has already earned a Bachelor's degree an avenue to acquire the Massachusetts' Initial Teacher Licensure as a secondary education mathematics teacher. The program requirements mirror those of the corresponding program for undergraduate students.

The minor in mathematics is designed to provide the student with a firm mathematical foundation needed to successfully pursue the study of higher level mathematics or to provide a solid mathematical basis for advancing in the study of another quantitative or scientific discipline. The level of mathematical attainment in the minor program is approximately equal to one half that in the mathematics major program.

The mathematics minor for Early Childhood, Elementary and Special Education Students is designed to provide Early Childhood, Elementary and Special Education students who are interested and strong in mathematics, with an opportunity to study further mathematics that is appropriate for their future teaching career. Students who complete this program will have the opportunity to become mathematics specialists in elementary school.

Courses and programs to serve other disciplines are designed to provide students with the particular mathematical understandings and skills required in those other disciplines. Periodic consultation with faculty of the partner disciplines aims to insure that these students are equipped with the requisite mathematical skills for their programs of study.

Courses to fulfill core Liberal Arts and Sciences requirements are designed to provide students with an understanding of mathematics as an academic discipline which can be used to solve a wide variety of problems encountered in many diverse areas. These courses also aim to enhance the problem solving and analytical skills of the students and expose them to college level mathematics.

The developmental mathematics program is designed to give students the basic numerical and algebraic skills needed for the successful study of college level mathematics courses or other college level courses which require quantitative or mathematical skills. All Fitchburg State students, except those transfer students who transferred in a college level mathematics course, are required to pass either the Algebra Accuplacer Test or Basic Mathematics II

(MATH 0200) at Fitchburg State University before they take any mathematics course at the 1000-level or higher.

Note that Fitchburg State offered a *Master of Arts Program in Teaching Mathematics* which ran from 1999 until 2004. Although the program is still in the course catalog, it is in suspension due primarily to insufficient demand.

2.   Description of the Curricula

2.1   The Bachelor of Science or the Bachelor of Arts in Mathematics

This program provides a comprehensive foundation in abstract and applied mathematics as preparation for graduate school or a professional career. The program is comprised of 42 credit hours of course work. The requirements are listed below.

Required Courses in Mathematics

MATH 2300	Calculus I
MATH 2400	Calculus II
MATH 2600	Linear Algebra
MATH 3300	Calculus III
MATH 3400	Calculus IV
MATH 4300	Abstract Algebra*
MATH 3900	Mathematics Seminar

The student must also complete 5 additional mathematics courses at the 3000 or 4000 level, 3 of which must be at the 4000 level.

Required Courses in other Departments

SPCH 1000	Introduction to Speech Communication**
or *SPCH 1100*	Argumentation and Debate**
CSC 1500	Computer Science I***

*fulfills Fitchburg State junior-senior writing requirement
**fulfills Fitchburg State speaking and listening requirement
***fulfills Fitchburg State computer literacy requirement

Note: Students pursuing a Bachelor of Arts degree as opposed to a Bachelor of Science degree are also required to obtain proficiency of a foreign language at the intermediate level. This can be done by completing appropriate coursework and/or by attaining a sufficiently high score on the CLEP exam.

See Appendix 2.1a for the suggested Four Year Plan of Study for the mathematics major program.

2.2 The Bachelor's in Mathematics with Initial Teacher Licensure, Grades 8 – 12

This program provides students with both a broad introduction to high school teaching and specific instruction in the theory, research and practice of secondary Mathematics teaching. Students engage in field-based experiences in the school setting supervised by our faculty through on-site pre-practicum experiences coupled with each teaching course and a formal teaching practicum as the capstone experience. The program is comprised of 42 credit hours of course work for the mathematics major and 24 hours of course work, pre-practicum and practicum experiences in education.

Required Courses in Mathematics

MATH 2300	Calculus I
MATH 2400	Calculus II
MATH 2600	Linear Algebra
MATH 3000	Geometry
MATH 3300	Calculus III
MATH 3400	Calculus IV
MATH 4200	Probability and Statistics I
MATH 4300	Abstract Algebra*
MATH 3900	Mathematics Seminar

The student must also complete 3 additional mathematics courses at the 3000 or 4000 level, 2 of which must be at the 4000 level.

Required Courses in other Departments

SPCH 1000   Introduction to Speech Communication**
or *SPCH 1100*   Argumentation and Debate**

CSC 1500   Computer Science I***

*fulfills Fitchburg State junior-senior writing requirement
**fulfills Fitchburg State speaking and listening requirement
***fulfills Fitchburg State computer literacy requirement

Required Courses for Initial Licensure in Secondary Education Mathematics

MATH 2860   Introduction to Secondary School Teaching
SPED 3800   Secondary Programs for Adolescents (14-22) with Disabilities

ENGL 4700   Teaching Reading and Writing Across the Content Area
MATH 4850   Methods and Materials in Secondary Mathematics
MATH 4860   Mathematics Practicum in Secondary School I (150 hrs.)
MATH 4870   Mathematics Practicum in Secondary School II (150 hrs.)

See Appendix 2.1b for the suggested Four Year Plan of Study for the mathematics major program with initial teacher licensure, grades 8-12.

2.3 The Bachelor's in Mathematics with Concentration in Applied Mathematics

Students who complete the concentration in Applied Mathematics will have a strong mathematical background, an emphasis in a second field and will be able to integrate the mathematics within that field. The program consists of 54 hours of course work in mathematics and science. In addition a minor in a partner discipline is required.

Required Courses in Mathematics

MATH 1850   Freshman Seminar in Applied Mathematics
MATH 2300   Calculus I
MATH 2400   Calculus II
MATH 2600   Linear Algebra
MATH 3300   Calculus III
MATH 3400   Calculus IV
MATH 3500   Methods in Applied Mathematics
MATH 4400 or   Operations Research **or**
MATH 4450   Mathematical Modeling
MATH 4600   Senior Seminar in Applied Mathematics*
MATH 3900   Mathematics Seminar

The student must also complete 4 additional courses (three of which must be at the 3000 level or higher) selected from the following:

MATH 1900   Discrete Mathematics
MATH 2500   Introduction to Mathematical Thought
MATH 3150   Elementary Number Theory
MATH 3550   Differential Equations
MATH 4200   Probability and Statistics I
MATH 4250   Probability and Statistics II
MATH 4300   Abstract Algebra
MATH 4350   Complex Analysis

MATH 4400 or   Operations Research **or**
MATH 4450   Mathematical Modeling

MATH 4500   Numerical Analysis

Required Courses in other Departments

PHYS 2300   General Physics I

PHYS 2400   General Physics II

SPCH 1000   Introduction to Speech Communication**
or *SPCH 1100*   Argumentation and Debate**

CSC 1500   Computer Science I***

*fulfills Fitchburg State junior-senior writing requirement
**fulfills Fitchburg State speaking and listening requirement
***fulfills Fitchburg State computer literacy requirement

Required Minor in another Department
A core aspect of the applied mathematics program is knowledge of another field. The student must also minor in one of the following areas: Computer Science, Psychology, Biology, Chemistry, Economics or Geography/Earth Science. Note: Many of the courses in the minor can be counted toward the Liberal Arts and Science (LA&S) courses.

See Appendix 2.1c for the suggested Four Year Plan of Study for the mathematics major program with concentration in applied mathematics.

2.4   Post-Baccalaureate Program in Mathematics Education, Grades 8-12

Students who already hold a bachelor's degree and wish to attain the Massachusetts' Initial Teacher Licensure as a secondary mathematics teacher, may complete a post baccalaureate program that consists of the equivalent of an undergraduate major in mathematics and 24 credit hours of pedagogical coursework as shown below.

MATH 2860   Introduction to Secondary School Teaching
SPED 3800   Secondary Programs for Adolescents (14-22) with Disabilities
ENGL 4700   Teaching Reading and Writing Across the Content Area
MATH 4850   Methods and Materials in Secondary Mathematics
MATH 4860   Mathematics Practicum in Secondary School I (150 hrs.)
MATH 4870   Mathematics Practicum in Secondary School II (150 hrs.)

Students who enroll in this program must meet the following criteria:
- A bachelor's degree with a cumulative GPA of 2.8 or higher

- Successful completion of the Communication and Literacy Skills Sub-test of the Massachusetts Test for Educator Licensure (MTEL).

Once accepted, students will undergo a transcript review by the undergraduate advisor, as designated by the department, and a plan of study will be developed that addresses both the education requirements and the mathematical requirements needed to complete the program. Students will complete all requirements of the major and license as identified in the undergraduate program. Once a student has completed all requirements for professional and content-specific courses, the student will be eligible for endorsement for the initial licensure in secondary mathematics through Fitchburg State University.

2.5 Requirements for the Minor in Mathematics

A minor in Mathematics is comprised of 23 semester hours of mathematics coursework as follows:

• Eight semester hours of Calculus I and II
• Either Abstract or Linear Algebra
• Four mathematics electives, at most one of Discrete Mathematics, Informal Geometry or Introduction to Mathematical Thought. Three or more of these electives must be at the 3000 or above level and at least one of them must be at the 4000 level.

The majority of students earning a minor in mathematics are either Computer Science majors or Middle School Education majors who have chosen interdisciplinary studies as their second major with a concentration in mathematics.

2.6 Requirements for the Mathematics Minor for Early Childhood, Elementary and Special Education Students

This minor is comprised of 21-23 credit hours as follows:

• MATH 1500 Informal Number Theory
• MATH 1300 Precalculus
• MATH 2000 Informal Geometry
• One of MATH 2100 Technical Calculus or MATH 2300 Calculus I
• One of MATH 1900 Discrete Mathematics or MATH 2500 Introduction to Mathematical Thought

Two of the following courses:
   MATH 1700 Applied Statistics (if this is taken, MATH 1900 may not be taken)
   MATH 2400 Calculus II
   MATH 2600 Linear Algebra
   MATH 3000 Geometry
   MATH 3150 Elementary Number Theory
   Any 3000 or 4000 level 3-credit mathematics course except MATH 4850, 4860 & 4870

Middle School Education students pursuing the Mathematics Track must complete a major in mathematics in addition to the other requirements of their program. Middle School Education students pursing the Mathematics/Science Track must complete a minor in mathematics in addition to the other requirements of their program.

2.7 Mathematics Department Courses

Below is a list of all departmental courses. Most of the upper level mathematics electives are offered on a two year rotating schedule. See Appendix 2.2 for the Mathematics Course Scheduling Plan.

Math 0100   Basic Mathematics I
Math 0200   Basic Mathematics II
Math 1200   Finite Mathematics
Math 1250   Introduction to Functions
Math 1300   Precalculus
Math 1500   Informal Number Theory
Math 1600   Informal Mathematical Modeling
Math 1700   Applied Statistics I
Math 1800   Business Statistics
Math 1850   Freshman Seminar in Applied Mathematics**
Math 1900   Discrete Mathematics
Math 2000   Informal Geometry
Math 2100   Technical Calculus
Math 2200   Business Calculus
Math 2300   Calculus I*
Math 2400   Calculus II*
Math 2500   Introduction to Mathematical Thought
Math 2600   Linear Algebra
Math 2700   Applied Statistics II
Math 2860   Introduction to Secondary School Teaching
Math 3000   Geometry
Math 3150   Elementary Number Theory
Math 3200   History of Mathematics
Math 3300   Calculus III
Math 3400   Calculus IV
Math 3500   Methods of Applied Mathematics
Math 3550   Ordinary Differential Equations
Math 3900   Mathematics Seminar**
Math 4000   Real Variable Theory
Math 4050   Topology
Math 4150   Advanced Multivariate Calculus
Math 4200   Probability and Statistics I
Math 4250   Probability and Statistics II
Math 4300   Abstract Algebra
Math 4350   Complex Analysis

Math 4400   Operations Research
Math 4450   Mathematical Modeling
Math 4500   Numerical Analysis
Math 4600   Senior Seminar in Applied Mathematics**
Math 4850   Special Methods in Teaching Mathematics
Math 4860   Mathematics Practicum in a Secondary School I (6-credits)
Math 4870   Mathematics Practicum in a Secondary School II (6-credits)
Math 4900   Independent Study (1, 2, or 3 credits)
Math 4901   Independent Study (1, 2, or 3 credits
Math 4975   Directed Study (1 – 6 credits)

Note: All are 3-credit courses unless otherwise noted.
*   4-credit course.
** 1-credit course (which can be repeated once for credit).

The following courses are new since our last program review in 2006: Math 1500, 1600, 1850, 2100, 3500, 4600.

Topics courses (at the appropriate level) defined as experimental courses, may be scheduled for up to two semesters prior to being submitted to governance for formal approval as regular course offerings.

2.9   Mathematics Requirements for Other Majors

All students, regardless of major, must complete at least one college level mathematics course to satisfy the Liberal Arts & Sciences Program Requirement. Some majors specify which particular mathematics course or courses its students must take.

Specific mathematics courses required by various major programs are outlined below.

Major	**Mathematics Course**
Biology	Two courses at or above the level of *Math 1300 Precalculus*
Business Administration	*Math 1250 – Introduction to Functions* *Math 1800 – Business Statistics* *Math 2200 – Business Calculus*
Computer Information Systems	*Math 1250 – Introduction to Functions* *Math/CSC 1900 – Discrete Mathematics* *Math 2200 – Business Calculus* *Math 1800 – Business Statistics*
Computer Science	*Math 1300 – Precalculus* (if needed) *Math 1800 – Business Statistics* *Math/CSC 1900 – Discrete Mathematics*

	Math 2300 – Calculus I
	Math 2400 – Calculus II
	Math 2600 – Linear Algebra
Criminal Justice	*Math 1700 – Applied Statistics I*
Economics	*Math 1250 – Introduction to Functions*
	Math 1800 – Business Statistics
	Math 2200 – Business Calculus

Early Childhood, Elementary and Special Education

Math 1500 – Informal Number Theory
Math 1600 – Informal Mathematical Modeling
Math 2000 – Informal Geometry

Geography/Earth Science	Two courses at or above the level of *Math 1300 Precalculus*
Industrial Technology	*Math 1300 – Precalculus*
Industrial Technology (Architecture Students only)	*Math 2100 – Technical Calculus* (in addition to Math 1300)
Nursing	*Math 1700 – Applied Statistics I*
Political Science	*Math 1700 – Applied Statistics I*
Psychology	*Math 1700 – Applied Statistics* I
All other majors	One college level mathematics course

The Mathematics Department has prepared a "Guide to Mathematics Courses" that it sends to all faculty advisors prior to each registration period to help insure that students are directed to the most appropriate mathematics courses for their program and their level of preparation. See Appendix 2.3.

3. Relationship of Courses and Curriculum to Objectives and Mission

Department Mission Statement

The mission of the Department of Mathematics is to foster our students' self-reliance in mathematics, to produce graduates who can bring together the theory and practice of mathematics, and to create in graduates, strengthened ability for critical and logical thinking.

The sections below detail how our curriculum is related to our Departmental Mission.

3.1 Major Course Requirements

The Bachelor of Science and the Bachelor of Arts in mathematics consist of a core curriculum (Calculus I, II, III, and IV, Linear Algebra, Abstract Algebra, Introduction to Mathematical Thought, Mathematics Seminar) and five electives from upper level mathematics courses, including at least three at the 4000-level*.* The mathematics major is designed to help ensure that students will meet the program goals.

Goals for the Mathematics Major

It is expected that each undergraduate mathematics major, upon graduation from Fitchburg State University, should:

- possess an understanding of the breadth of the mathematical sciences and their deep interconnecting principles.
- be able to apply mathematics to a broad spectrum of complex problems and issues by formulating and solving problems.
- be able to read, write, listen, and speak mathematically, as well as to be able to read and understand technically-based materials and to contribute effectively to group efforts.
- have an understanding of the appropriate uses of technology in mathematics.
- be adequately prepared for a mathematically-oriented career.

These are the Goals for the Mathematics Major as stated in the Department's Outcomes Assessment Plan. The relationship of these goals to the courses and curriculum is included below.

The inclusion of the calculus sequence, Calculus I, II, III, and IV, in the program is standard practice among institutions of higher learning. Our calculus sequence is essentially a sequence of four three-credit courses with an added one-credit computer lab component attached to the Calculus I and Calculus II courses. The ideas and techniques of calculus are used in most applied mathematics courses and in advanced level courses in analysis. See Appendix 2.4 for samples of students completed lab assignments.

In addition, the mathematical sophistication gained by the students in the calculus courses is helpful in all advanced level courses. Fitchburg State was amongst the earliest schools to include a laboratory component to Calculus I and II. Students complete a weekly two-hour lab in each of these two courses. MAPLE is the principal software tool used in the calculus labs. Excellence, precision and completeness in expository mathematical writing are stressed on the lab reports. Thus in the calculus sequence students learn: to read and write mathematically, to interact and learn from others in the classroom lab, to use a computer algebra system as an exploratory and problem-solving tool, and to formulate and solve problems.

The *Introduction to Mathematical Thought* course introduces students at an early stage to both rigorous treatment of mathematics and certain basic mathematical ideas that occur in many branches of mathematics. This course is designed to teach the fundamental strategies

and styles used in mathematical proofs. Assignments demanding precise and clear writing of proofs are the norm for this course. So students learn: to have a better understanding of the breadth of the mathematical sciences and their deep interconnecting principles, to be able to apply mathematics to a broad spectrum of complex problems and issues by formulating and solving problems, to think logically, to be able to read, write, listen and speak mathematically, and to emulate a professional mathematician's approach to proving theorems. Many students work together outside of class but are required to write up their solutions individually. See Appendix 2.5 for student work samples.

The *Linear Algebra* course includes an introduction to solutions of linear equations in n-dimensional space. Besides being an applied course, Linear Algebra provides a first introduction to abstract mathematical systems through the study of vector spaces. The students learn that the techniques used in real space can be extended to more abstract solutions. MAPLE and MATLAB assignments are commonly used by the instructors of this course. Excellence, precision and completeness in mathematical expository writing are stressed on these assignments. Thus students learn: to use professional mathematics software commonly used in industry, to use technology as an exploratory and problem-solving tool, to refine their ability to formulate and solve problems, to experience the breadth of the mathematical sciences and their interconnecting principles, and to refine their ability to read and write mathematically and also to read technically based materials. In addition, since the lab assignments are done outside of class, students are encouraged to form informal groups and work together cooperatively. Most students do this. See Appendix 2.6 for student work samples.

The *Abstract Algebra* course is included in the core curriculum in recognition of the subject's foundational relationship to all modern mathematics. Concepts introduced in this course are shared with all branches of mathematics and help students to see similarity in diversity and perceive an underlying global theme in mathematics. This course meets the Fitchburg State junior/senior level LA&S writing requirement for the major in mathematics. Assignments demanding precise and clear writing of proofs are the norm for this course. So students learn: to emulate a professional mathematician's approach to the abstract thinking processes involved in proving theorems and the precision required in expressing these proofs in formal written form, to have a better understanding of the breadth of the mathematical sciences and their deep interconnecting principles, to apply mathematics to a broad spectrum of complex problems and issues by formulating and solving problems, and to be able to read, write, listen and speak mathematically. Most students form informal groups while working on the assignments. However, all are required to write up individual solutions and reports. See Appendix 2.7 for student work samples.

The *Mathematics Seminar* course exposes students to research and encourages them to read mathematical journals at the undergraduate level. Topics not ordinarily covered in other courses may be covered in the Mathematics Seminar. This course helps meet the Fitchburg State LA&S speaking/listening requirement for mathematics majors. Students give oral presentations and engage in mathematical expository writing. As a result of their work in this class, some students have given off-campus talks and/or have either had their solution to problems published in mathematical journals or been cited in the journal for having

submitted a correct solution. Thus students learn: to be able to read, write, listen and speak mathematically, to be able to read and understand technically-based materials, and to contribute effectively to group efforts. They are also better prepared for a mathematically oriented career.

The *upper level course requirements* allow students some flexibility in choosing courses germane to their interests while guaranteeing exposure to a reasonable amount of sophisticated and rigorous mathematics. When the requirements are completed, students will have engaged in expository mathematical writing, oral presentations, and group and individual projects, and will have used technology for many assignments in a variety of contexts*. Probability and Statistics I and II* are offered every year. These courses, along with several of the other upper level electives, incorporate the use of *Minitab*, *Excel*, and/or other technology, as appropriate. Most other electives are offered once every two years on a posted rotating schedule. See Appendix 2.2.

Independent Study offers flexibility for the mathematics major to take courses outside of the standard offerings. Some of our students intending to go to graduate school take one or more independent studies at the rigorous graduate level in algebra, analysis, or topology to help them prepare. Other students simply seek knowledge of an area that has interested them that is not available in electives. Recent independent studies have been in Topology, Abstract Algebra II and Linear Algebra II. Several faculty members have also recently supervised students in a *Directed Study* when a course or courses the students needed for timely graduation, were cancelled.

Additional flexibility is available through the offering of a topics course. A topics course in Graph Theory was offered in 2009. In spring 2009 the Department offered the following topics course: *MATH 4100 Graph Theory.* There has also been discussion of offering a topics course to prepare students for mathematics competitions.

3.2   Curriculum for Initial Licensure in Mathematics, Grades 8-12

Fitchburg State University's *undergraduate and post-baccalaureate mathematics secondary teacher preparation programs* lead to the Initial Licensure to teach mathematics for grades 8-12 in the Commonwealth of Massachusetts. These programs are part of the Education Unit, which includes all teacher preparation programs at the University. Under the regulations of the Massachusetts Department of Elementary and Secondary Education (DESE), all candidates for Initial Licensure must pass the Communication and Literacy and Mathematics subject area exams of the Massachusetts Tests For Educator Licensure (MTEL). Fitchburg State University has adopted the policy that students may not enroll in a teaching practicum until they have passed these exams. The test objectives for the Mathematics subject area exam are (1) Number sense and operations; (2) Patterns, relations, and algebra; (3) Geometry and measurement; (4) Data analysis, statistics, and probability; (5) Trigonometry, calculus, and discrete mathematics. The subject matter knowledge requirements set by the DESE are (1) Abstract algebra; (2) Number theory; (3) Calculus through differential equations; (4) Probability and statistics; (5) Non-Euclidean and transformational geometries; (5) Applied

mathematics or mathematics modeling. Our curriculum is designed to help students meet these subject matter requirements.

These programs must also include field-based experiences in varied settings that are integrated into the courses or seminars that address these standards. These field-based experiences can include observation of a variety of classrooms as well as other pre-practicum activities. In addition, the students are required to complete a supervised practicum of at least 300 hours at the secondary level. The practicum must be supervised jointly by someone from the sponsoring program and a supervising practitioner with at least three years of teaching experience under an appropriate Initial or Professional License. The program supervisor and supervising practitioner must complete a performance assessment of the teacher candidate using the professional standards.

To address these requirements, candidates in Secondary Education Mathematics at Fitchburg State complete 90 hours of pre-practicum. Each candidate completes a 25-hour pre-practicum in mathematics in conjunction with each of three different pedagogy courses, *MATH 2860* Introduction to Secondary School Teaching, *ENGL 4700* Teaching Writing in Secondary Schools, and *MATH 4850* Special Methods in Teaching Mathematics. Candidates must also complete a 15-hour pre-practicum in Special Education as part of the course *SPED 3800* Secondary Programs for Adolescents (14-22) with Special Needs. The completion and nature of the pre-practicum experience are supervised jointly by the faculty member teaching the associated class and the supervising practitioner in whose classroom the candidate is conducting the pre-practicum. The supervising practitioner documents the candidate's involvement in pre-practicum activities that are categorized as groups A, B and C. Type A activities involve passive observation of the class. Type B activities require interaction with the students either directly or through grading, and type C activities include running all or portions of the class. By the time candidates complete all pre-practicum experiences they must have documented participation in all three types of activities. In addition each supervising practitioner must complete a Candidate Dispositions form.

Candidates in our program can only be accepted into the teaching practicum if, by the end of their junior year they have:
- completed 75 credits of coursework.
- earned a 2.75 overall GPA and a 3.0 GPA in their mathematics major.
- completed all the pre-practicum requirements.
- received passing scores on the Mathematics subtest of the MTEL.
- received at least four Candidate Dispositions Assessments (at least one from a supervising practitioner in a pre-practicum and one from a full-time faculty member in Education).
- completed the Mantoux TB screening test and a criminal background check.

In addition candidates must have positive evaluations of at least 75 hours of pre-practicum experience, a portfolio review, and positive recommendation from their advisor, the faculty of the Mathematics Department, and the Dean of Education.

When candidates have met these requirements, and have completed all other requirements for graduation, they start their student teaching. Candidates are observed during their student teaching practicum by the college supervisor a minimum of eight times during the semester-long practicum. A unit-wide assessment of each observation is completed by the University supervisor and inserted into the candidate's practicum file. Lesson plans are also evaluated at each visit with the unit's rubric and these evaluations are also compiled in the candidate's practicum file. During the practicum, candidates' dispositions are also evaluated by the supervising practitioner and the college supervisor utilizing the Unit's Dispositions Assessment form. All of these assessment items are included in the Candidate's practicum file and serve as additional pieces of evidence that the candidate has satisfied the initial licensure requirements of the Massachusetts Department of Education.

At least twice during the practicum the Massachusetts Pre-service Performance Assessment is reviewed by the college supervisor, supervising practitioner and the candidate to assess the candidate's performance in meeting state standards for licensure. This assessment involves completing the Practicum Evaluation Report. During the final review of these standards, it is determined if a candidate will/will not be recommended for licensure based on the compilation of evidence in the candidate's file and his/her ongoing work in the practicum. The evidence for meeting the standards must be described in detail on the Massachusetts Pre-service Performance Assessment form. See Appendix 2.8 for sample portfolios.

The Fitchburg State mathematics secondary programs have national certification from the National Council for Teachers of Mathematics (NCTM) and from the National Council for the Accreditation of Teacher Education (NCATE).

3.3 The Mathematics Major with Applied Mathematics Concentration

With the exception of MATH 4300 Abstract Algebra, this concentration includes the same requirements as in the regular Mathematics Major. See section 3.1. In addition, it includes physics, applied mathematics courses and a minor in another field. The descriptions and goals of the applied mathematics courses are explained below.

The *Freshman Seminar in Applied Mathematics* is a one credit course consisting of a series of talks given by members of the Applied Mathematics community (either in academia or industry) demonstrating an application of applied mathematics with preparatory and follow-up work.
The goal of the course is to present students with real-world applications of mathematics. It introduces students to possible areas of study and the mathematics used in the talks. The students are introduced to background mathematics that is used in the talks, which gives them motivation for a thorough grounding in mathematics as well as the application.

The *Methods of Applied Mathematics* course is designed for students to learn the basic techniques necessary for performing research in an application of Mathematics to another field of study. The students also learn to use a Computer Algebra System for analysis and visualization. The goal is to give the students a firm foundation for pursuing further study in Applied Mathematics, as well as have a good appreciation for the use of Computer Algebra

Systems to aid the analysis and visualization of mathematical problems. In addition to gaining a thorough understanding of the topics covered, this course aims to improve students' mathematics communication skills both in written and oral form.

The *Mathematical Modeling/Operations Research* requirement emphasizes the mathematics used in applications to the physical, social and life sciences. Operations Research includes linear programming, network modeling, dynamic programming and stochastic models. Mathematical Modeling includes some of these concepts but studies applications of mathematics more broadly. In both courses students are exposed to using computer programs to help solve problems.

The *Senior Seminar in Applied Mathematics* is a three credit course designed for seniors in applied mathematics to develop and complete a senior project. This is the capstone course in Applied Mathematics and the project should be a synthesis of his/her previous courses. The students will meet regularly with the instructor to provide consultation with their project and work in conjunction with other students as needed. The course will be offered for the first time in Fall 2012.

These courses, in addition to the mathematics major requirements aim to develop and enhance the skills noted in the goals for the mathematics major and prepare students for a 21st century job involving applied mathematics.

3.4   The Mathematics Minor

The *minor in mathematics* includes a core of three courses along with four elective courses. The *Calculus I* and *II* requirement gives the students a solid background in differential and integral calculus and the experience of working with mathematical software to solve problems. The *Linear Algebra/Abstract Algebra* requirement exposes the students to abstract mathematical thought and gives them a good base in reading and writing mathematical proofs. See section 3.1 for more details on these courses and their attributes. The electives students choose further enhance and broaden their mathematical abilities and problem solving skills. The skills they obtain should complement their major studies and will give them an edge when applying for jobs. The majority of students who minor in mathematics are either Computer Science majors or Middle School Education majors in the Math/Science Track.

3.5 The Mathematics Minor for Early Childhood, Elementary and Special Education

This minor includes mathematics courses specially designed for education majors as well as a variety of other courses aimed to give students a deep understanding of the concepts they will teach and how these concepts grow into more advanced mathematics.

The *Informal Number Theory* and *Informal Geometry* requirements address in depth, the mathematics taught in the elementary classroom and stress explanations and multiple representations of concepts and solutions. The students do a lot of writing and explaining in

both of these courses. Furthermore, Informal Geometry is a discovery learning lab based course which uses a wide variety of manipulatives that the students will one day use in their own classrooms.

The *Discrete Mathematics/Introduction to Mathematical Thought* requirement exposes the student to set theory and mathematical logic which is essential to successfully communicating mathematics. In *Calculus I* or *Technical Calculus* the students learn about the ubiquitous concept of instantaneous rate of change and gain the mathematical maturity to take higher level courses. They also obtain valuable experience working with mathematical software and writing lab reports, further enhancing their mathematical communication skills.

Students completing this program have a solid understanding of the mathematical theory that unifies the concepts taught in the elementary schools. They understand how theories in arithmetic are generalized to algebraic theories and how these concepts are further developed and expanded in other mathematical fields such as calculus, statistics, or geometry.

This program allows students to become mathematics specialists in the elementary school. Improvement of mathematics programs in the elementary schools is a continuous goal of not only the Massachusetts' Department of Elementary and Secondary Education, but of every state and national education conference or professional organization. Education students completing this minor will be prepared to take a leadership role in improving the teaching of mathematics in the elementary school classrooms.

3.6 Other Programs/Courses

Requirements for other majors detail the importance of the Mathematics Department to cognate departments and to other departments which require mathematics courses as part of their major program. These courses are concentrated in various areas of applied mathematics as they relate to such disciplines as business, biology, computer science, industrial technology, nursing, and psychology.

Service courses are designed to achieve maximal applicability with respect to the need and desire of the other departments. Courses are frequently updated as a result of consultation, both formal and informal, with faculty in other disciplines. For instance, since our last program review in 2006, the Mathematics Department worked closely with the Education Department and outside consultants to change and strengthen the mathematics requirements for Early Childhood, Elementary and Special Education majors to better prepare them for their future careers in teaching. As a result, two new courses were developed, *Informal Number Theory* and *Informal Mathematical Modeling* and the number of courses required by these students was increased to include these two courses as well as *Informal Geometry*. See Appendix 2.9 and 2.10 for samples of student work in Informal Mathematical Modeling (Math 1600) and Informal Geometry (Math 2000) respectively. The Mathematics Department also worked with the Industrial Technology Department to develop a calculus course specially designed for their majors: *Technical Calculus*, which has been offered once a year since 2007 when it was developed.

In addition, the Mathematics Department has offered certain classes online at the request of other departments. *Applied Statistics* has been offered online for the past few summers for Nursing students and more recently, *Business Statistics* and *Business Calculus* have been offered as part of a new online Bachelor of Science in Business Administration program. See Appendix 2.11 for the departmental guidelines for online courses. See Appendix 2.12 for samples of student work in Applied Statistics (Math 1700).

The *Mathematics Readiness Program* (MRP) was designed by the Mathematics Department in 1987 to ensure that students are prepared for college-level mathematics. All students who enter Fitchburg State University as freshmen must either pass an Accuplacer Placement Test or pass *Math 0200 Basic Mathematics II* at Fitchburg State. There is a *Math 0100 Basic Mathematics I* course designed for students who need preparation for *Math 0200*. See Appendix 2.13 for the current Fitchburg State Mathematics Readiness Requirement. An important component of the program is that students can pass Basic Mathematics I or Basic Mathematics II only if they pass the comprehensive final examination. Because of this rigorous requirement, passing a developmental or remedial mathematics course taken at another institution is not accepted as proof of meeting the Fitchburg State Mathematics Readiness Requirement. These courses have a common syllabus and common exams created by the program coordinator. They are offered during each semester and in the summer. In 2008, our MRP underwent a formal program review conducted by Ms. Christina Gundlach, coordinator of the Math Center and Developmental Program at Central Connecticut State University. See Appendix 1.3. The review was generally positive and no significant changes were made. In Fall 2010, a new college policy was implemented that exempts transfer students from our MRP if the student transferred in a college level mathematics course or passing score on a mathematics placement exam from another Massachusetts state institution of higher education. The Mathematics Department was not in favor of this policy change which was proposed without any input from our Department or any other academic department on campus. We are attempting to monitor the success rate in mathematics courses for the students for whom this exemption applies.

4. <u>Curriculum Trends</u>

Programs in Applied Mathematics have been growing in popularity. According to the *Report to the Second Stage Academic Planning Group: Forecasting Fitchburg State College New Majors and Socio-economic Trends Impacting New Majors* written in April 2008, Applied Mathematics is one of the top ten majors in North Central Massachusetts. See Appendix 2.14. In 2008 our department developed an Applied Mathematics Concentration, along with three new courses, which addresses this demand. The program now has a handful of students in it and more are interested. See sections 2.3 and 3.3 for details on this concentration.

Another recent trend is that more students are seeking minors in mathematics. Our minor numbers have grown significantly in the past two years. See the STUDENT DATA APPENDIX under *Enrollments*. This is due in part to our new mathematics minor for education students but our regular mathematics minor numbers have increased as well. We have not done any research to determine the reason(s) for this growth, but some disciplines are recommending more mathematics and certainly more jobs are demanding it. Another

possible contributing factor is the fact that we have recently designated two faculty members to serve as advisors to our mathematics minors, one for the regular minor and one for the minor for education students.

Since the last review there has been a big push for pre-service elementary teachers to take more mathematics. The Massachusetts Department of Education (DOE) *Guidelines for the Mathematics Preparation of Elementary Teachers* released in July 2007 (Appendix 2.15) recommends that elementary education students take at least three mathematics classes and at the time most teacher preparation programs were only requiring one or two mathematics content courses. In 2009, the passing requirements for mathematics on the Massachusetts Test for Educator Licensure (MTEL) were made more rigorous and many teacher preparation programs were working toward appropriate changes. By this time, Fitchburg State had already increased the number of mathematics courses required for Early Childhood, Elementary and Special Education students and created two new courses as part of this requirement. Shortly thereafter, our department developed the new mathematics minor designed for these students, giving them an opportunity to become mathematics specialists in the schools. See sections 2.6 and 3.5 for more details. This minor currently has about 5 students.

5. **Outcomes Assessment Plan (for the mathematics major program)**

In Fall 2005 Semester the Outcomes Assessment Plan (see Appendix 1.4) was passed. This plan included the following Goals for the Mathematics Major and the related objectives for each goal.

It is expected that each undergraduate mathematics major, upon graduation from Fitchburg State University, should

1. possess an understanding of the breadth of the mathematical sciences and their deep interconnecting principles.

   To meet this goal each undergraduate mathematics major has:
   - demonstrated an understanding of the concept of a function and its related topics.
   - demonstrated an understanding of the basic concepts of calculus.
   - demonstrated a knowledge of the abstract structures in mathematics.

   - demonstrated competency in several mathematical subfields outside of abstract algebra.
   - demonstrated an understanding of the commonality of different branches of mathematics.

2. be able to apply mathematics to a broad spectrum of complex problems and issues by formulating and solving problems.

   To meet this goal each undergraduate mathematics major has:

- demonstrated using mathematics as a tool in solving applied problems.

3. be able to read, write, listen, and speak mathematically, as well as to be able to read and understand technically-based materials and to contribute effectively to group efforts.

   To meet this goal each undergraduate mathematics major has:
   - given oral presentations on mathematical topics.
   - demonstrated the ability to write correct proofs.
   - demonstrated the ability to write expository mathematics.
   - participated in group assignments or projects

4. have an understanding of the appropriate use of technology in mathematics.

   To meet this goal, each undergraduate mathematics major has:
   - demonstrated correct use of technology in mathematical situations.

5. be adequately prepared for a mathematically-oriented career.

   To meet this goal, each undergraduate mathematics major has:
   - demonstrated adequate preparation for his/her postgraduate experience.

Evidence of student achievement in these goals (and each goal's related objectives) was to be compiled in a student dossier that would include:
- a proof involving the concepts of a function and its related topics
- lab report from Calculus I or Calculus II (or other writing assignment)
- a proof from Abstract Algebra, Linear Algebra, or Number Theory
- a problem from an area of mathematics that uses concepts from another area
- a solution of an applied problem from each of two different courses
- a proof from Abstract Algebra and Introduction to Mathematical Thought
- report of a group project
- an assignment from Calculus I, Calculus II, or Linear Algebra, and an assignment using technology from another mathematics course

Other tools used in the Outcomes Assessment Plan include: MTEL scores, skills evaluation report (including items on the concept of a function and the basic concepts of calculus), transcripts, presentations, exit interviews or surveys, and alumni surveys. Not all evidence may be present for each student. The implementation of this plan was left to the Mathematics Assessment Committee.

Initial Work
The first stages of enacting the assessment plan included collection of student work and collaboration with the Director of Assessment. Samples of student work were collected for use after assessment instruments had been developed. Meetings with the director of assessment worked on collection methods that would facilitate the collection, and assessment of student work within the TK20 software which was licensed for campus-wide use in 2006.

Development of Rubrics and other instruments: To assess the evidence collected the following rubrics have been developed: technology lab report rubric, student presentation rubric, proof writing rubric. In addition the assessment committee has developed skills lists for Calculus II, Applied Mathematics and a proof reading quiz. The process for developing these assessment instruments has been the following:

1. Draft instrument
2. Use draft of instrument with real student work
3. Discuss and revise instrument
4. Implement instrument (often through TK20)
5. Begin cycle of data collection and analysis
6. Use of data (two branches here – change rubric more or develop new assignments)

For the student presentation rubric, proof writing rubric, and a proof reading quiz we have reached stage 5 (that is we have begun collecting and analyzing data, but not yet begun using that data in curricular development). A table summarizing the efforts of the Assessment Committee (aligned along the goals set forth in the plan) can be found in Appendix 2.16. The technology lab report rubric has gone through the full cycle, and the Maple Lab activities in Calculus 1 and 2 have been revised.

Examples of student labs and the corresponding evidence collected as part of the plan can be found in Appendix 2.4 and Appendix 2.17 respectively.

Use of Assessment Data:

The primary use of assessment data has been the refinement of the assessment process – namely that to be able to assess the goals that we have set we must be setting assignments crafted to highlight the students' skills in the areas related to our goals. In the fall of 2011 two of our assessment committee members received a grant to create such rich assignments for the Maple lab portions of our Calculus 1 and 2 courses. Members of the committee have recently received another grant to rewrite many of the Calculus labs based on the technology rubric developed by the committee and some of the data they collected. In addition to the changes in the Calculus lab assignments mentioned above, there have been several areas where our department's assessment discussions have effected curricular change. Notable among these changes is the development and adoption of a set of common expectations with regards to homework, proof writing, and labs. See Appendix 2.18. A second curricular change, which occurred during the period of review, is the development of Math 1500 and Math 1600, courses designed to meet the needs of our teacher candidates especially with regards to the Mathematics Subtest of the MTEL General Curriculum examination.

A summary of departmental assessment activities for AY10/11 can be found in the Appendix 2.19.

6.   Effectiveness of the Curriculum

All of our available evidence indicates that overall the mathematics program at Fitchburg State is sound, the teaching/learning process is usually satisfactory and sometimes exemplary, and students are quite satisfied with the time and attention they receive from their mathematics instructors. Recent survey information obtained from both current students and alumni of our program support these conclusions. Students and alumni alike are satisfied with the Fitchburg State mathematics program. They rate the mathematics faculty members as knowledgeable, caring and respectful instructors who are available to students and go the extra mile to insure student success.

Moreover, current students and current faculty have very similar perceptions concerning those characteristics of the Fitchburg State mathematics program that foster students' success and those that can be viewed as program limitations. The most often cited strength of the Fitchburg State mathematics program is the personal attention students receive from the faculty. The minimal number of advanced level required or elective courses that can be offered each semester is cited as a definite limitation of the program.

The small number of mathematics majors at Fitchburg State (approximately 40) contributes to both the availability of instructor's time for giving personal attention to students, and the lack of choice for elective classes. The recruitment and retention of qualified mathematics majors is an ongoing goal of the department. The number of mathematics minors tripled from Fall 2009 to Fall 2010 and is still on the rise, but the Department has yet to be successful in increasing the number of majors. In an attempt to get some data on retention, the Department has recently started administering a survey to those students who switch out of the mathematics major. More details on this can be found in the FIVE YEAR PLAN/PLANS FOR CHANGE section.

6.1 Effectiveness from the Perspective of our Students

In Fall 2011 the department conducted a survey of the Mathematics Department Curriculum and Advising for Mathematics Majors. See Appendix 2.20. The advising data is addressed in the STUDENT DATA APPENDIX and the curriculum results are summarized here. All the respondents were satisfied with the overall mathematics program and felt their questions to instructors would receive a prompt, accurate, courteous and respectful response. In addition, 78.5% were satisfied with the course offerings and scheduling and felt they have ample opportunity to be involved in departmental extracurricular activities. The weakness that was mentioned the most was regarding course offerings. Concerns were expressed about frequency of course offerings and the fact that some desirable courses are not offered often enough. While our program is solid, the course offerings are definitely restricted. Because of the restricted offerings, most students don't have much choice of which elective mathematics courses to take. Currently most upper division mathematics majors must take any mathematics elective offered each of their last three or four semesters. This is a problem that is hard to solve given our size. Getting more majors would help of course. We would also need more faculty members to teach such courses on a regular basis and the support of the administration to be able to run such courses with low enrollment.

Two students raised the issue of lecture style teaching but based on other responses, most were satisfied with the teaching techniques used by the mathematics faculty. This is highlighted in the following responses from the question about the strengths of the program: "Great Professors and small classes", "I think the level of interaction the students have with their professors and/or advisors is a major strength at Fitchburg State". Other responses include: "They are always willing to help" and "Many of the instructors seem to be very friendly and passionate about student success and instruction". Some suggestions were to offer a larger variety of classes and to create an engineering program. Both of these are difficult to do with the current numbers and resources. However, we have recently offered some physics courses that help prepare students for engineering programs. All but two of the respondents said they would recommend the Fitchburg State mathematics program to others with comments including "absolutely", "of course" and "without a doubt".

See the STUDENT DATA APPENDIX under *Assessment of Mathematics Program Effectiveness* for more details.

6.2   Effectiveness from the Perspective of our Alumni

Our most recent survey of Alumni (which was run from March 2011 through September 2011) garnered 32 responses from alumni who graduated between 1974 and 2009. See Appendix 2.21. The responses were overwhelmingly positive, especially given the diversity of post-baccalaureate experiences reflected in the alumni responses. Of those alumni providing information on their current profession 34% were in the education field, 21% in Information Technology, 14% each in customer service or finance, 7% each in insurance and engineering, and 4% attending graduate school. 90% of the respondents indicated that their experiences at Fitchburg State adequately prepared them for their professional needs, while over 95% indicated that they would recommend the Mathematics program at Fitchburg State to someone whom they cared about. Comments offered by our alumni were very positive: "I am extremely satisfied with my mathematics education at FSC. The classes and curriculum were well paced. The department creates a student-centered environment. I was always able to contact a professor and have a quiet place to study in the math seminar/library room." is a quote, which highlights the many positive memories of studying mathematics at Fitchburg State. More heartening are the responses where alumni speak to the role mathematics has played in their professional life. For example, "Besides being a beautiful language, mathematics is a mental disciple that has given me the analytical ability to problem solve and be creative in coming up with answers to situations at work and in life. My job performance has always been excellent and my ability to deal with life situations has been enhanced because I was able to apply the thought process used to solve problems to every-day situations. Also, from a financial standpoint, it helps me make sound decisions in purchasing a home, saving for retirement, and loan decisions. Mathematics is not just a dry and number oriented program, but has a deeper and universal meaning that can teach a deep and meaningful philosophy to life."

 When prompted to identify weaknesses or suggestions for improvement a few themes appear. Firstly, there is the call for more guidance on the role mathematics can play in

various careers. Secondly, there is advice to offer more courses that highlight the applications of mathematics. There were also roughly equal calls for additional courses that would help students with actuarial sciences and computer science. Here students also expressed frustration with the cancelling of classes.

See the STUDENT DATA APPENDIX under *Assessment of Mathematics Program Effectiveness* for more details.

6.3   Effectiveness from the Perspective of our Faculty

In addition to the student survey discussed in section 6.1, the department also conducted a survey of the Mathematics Department Curriculum and Advising for Faculty. See Appendix 2.22. Once again, the advising data is addressed in the STUDENT DATA APPENDIX and the curriculum results are summarized here. There were 17 respondents, including 8 full time tenure track faculty and 9 part time faculty. All of the respondents felt that students' questions to instructors would receive a prompt, accurate, courteous and respectful response and 94% were satisfied with the overall mathematics program.

A little over half of the respondents were satisfied and 6% dissatisfied with the course offerings and scheduling. This issue of course offerings also came up as a weakness of the program in this survey. Course offerings could be improved upon given more administrative support to run small classes and hire more faculty members to teach them. The department also needs to continue recruitment and retention efforts to increase the number of majors. Our number of minors has gone up significantly recently, in part due to our new mathematics minor for education students and our newly designated mathematics minor advisors. However, our major numbers have remained about the same over the past 5 years. The hope is that our relatively new Applied Mathematics concentration will bring in some students but more recruitment efforts are certainly in order. As for retention, a survey is currently being given to students who switch out of the mathematics major and the department will use this data to help with new retention ideas.

Other weaknesses mentioned were lack of internships, class sizes for lower level classes being too large and the lack of appreciation for technology. One faculty member is currently looking into internship opportunities. The class size issue has been a university wide battle with the administration for some time now. The department chair continues to lobby for running upper division classes with low enrollment as well as keeping the service course enrollments at a manageable level. As for the technology issue, it is certainly true that some members of our department are not as much into exploring the new technologies available as others. This is a discussion the department should have so that ideas about incorporating more technology into our curriculum and classes can be shared. That said, most members of the department do use technology to some level in their teaching.

A reoccurring theme in the responses for strengths of the program is our dedicated and accessible faculty. Our faculty members are certainly competent and talented instructors who love to teach and it shows. In addition to putting copious amounts of time and effort into their regularly scheduled classes, faculty routinely give encouragement to students who

have expressed the desire to continue the study of mathematics at the graduate level. When such students are identified early, several of our faculty members endeavor to offer support via independent study projects designed to introduce these particularly capable and motivated students to more advanced topics and more rigorous development of these topics than would be possible for most of our other students. This adds greatly to the strength of the program and is especially notable since this type of faculty work is rarely acknowledged monetarily or otherwise.

Other strengths mentioned were small class sizes for courses in the mathematics major program, individual attention to advisees and students and the active Math Club and Pi Mu Epsilon chapter. Some suggestions were to work more collaboratively on curriculum and student needs, develop more connections with community colleges and to offer more online courses. Working together more on curriculum goals would certainly benefit the program. Now that we have some outcomes assessment data and rubrics we can begin the work of adjusting our curriculum accordingly. One idea that was to have common lab assignments for Calculus I and II that are aligned with our technology rubric. This is something that the department's Assessment Committee is currently working on. Regarding the other suggestions, the department has collaborated with some community colleges recently regarding the transfer of mathematics courses for education majors and one of our faculty members gave a presentation and handed out information on our program at a Mount Wachusett Community College Math Club meeting. In addition, the department has also offered 4 different courses online so far, 3 of which were based on the needs of other departments. More details on these can be found in the CURRICULUM section.

FIVE YEAR PLAN/PLANS FOR CHANGE

1.   Strengths/Weaknesses

The background information for this section is based on observations, informal conversations and surveys of current faculty members and current and former students. See Appendices 2.20, 2.21 and 2.22 for survey results.

1.1 Strengths

- The Department is a student centered environment where each major gets much individual attention from both their advisors and their instructors. The small class sizes and advising load makes this possible. The faculty members are accessible to and respectful of their students and advisees and there is a high degree of collegiality and camaraderie between department members and between faculty and students.

- The active Math Club and Pi Mu Epsilon chapter provide a great opportunity for students to get involved in professional and social mathematical activities outside of the classroom. These groups have sponsored a variety of events such as hosting guest speakers, problem solving sessions and social gatherings as well as attending and presenting at conferences, movie nights and math circles. These activities provide good experiences for students as well as a venue for more informal interaction between them and the mathematics professors.

- Several mathematics major classes include assignments that require the students to use mathematics software. For example, our Calculus I and II sequence has a lab component where the students meet once a week to work on assignments using Maple. Other such programs used are Matlab and Minitab.

- Faculty members are active and visible university-wide and have served on many committees. At least one mathematics faculty member is included on most of the important subcommittees of the ACC (All College Committee). Other committees that departmental members have served on during the review period include the Technology Advisory Committee, the VPAA Search committee, the Liberal Arts and Sciences Council and NEASC subcommittees. More details can be found in the FACULTY section.

- Some of the Department faculty members are very proactive when it comes to technology use both in class and online. These individuals have incorporated the use of tablets and smart boards into their teaching as well as Elluminate Live! and lecture videos for online courses.

- Members of the Department are generous with offering directed and independent studies.

- The Department is well balance with men and women and old and new faculty members giving a good variety of perspectives and ideas.

- The number of minors has recently increased due in part to the development of the new minor developed for education majors. In addition, the Department now provides mathematics faculty advising to mathematics minors which likely contributes to the retention of our minors. See the RESOURCES section for data on minors.

1.2 Areas for Improvement

- The Department does not currently offer any internships. Also, more guidance is needed for students, on the role mathematics can play in various careers.

- The upper division course offerings are very restricted leaving majors little choice of what mathematics electives to take. In addition, upper level electives or required courses have been cancelled due to low enrollments. See Appendix 3.1 for data on this.

- In spite of efforts to increase the number of majors in the Department, this number has remained relatively the same for the past several years. The Department needs to work more on recruitment and retention of majors.

- The class sizes for many lower level service courses are too large, making it difficult to give individual attention to the students that need it most.

- Only a few of the faculty members have recently pursued their scholarly activity to the point where the results were submitted for peer review and eventual publication. That said, faculty members continue to be active professionally despite the limited time available to them as members of an institution focused on teaching.

- There could be more widespread use of technology for the mathematics classes. In particular, appropriate computer algebra systems should be used as often as appropriate to better prepare the students for careers in industry. Such programs are already being used in Calculus I & II, Linear Algebra and some applied mathematics courses but they could be useful in other courses as well.
- The large number of part time faculty members creates considerable strain on the Department in many ways. While these faculty members are well qualified for their teaching assignments, they are not easily integrated into the life of the Department.

2.   <u>Plans for Change</u>

Future plans and changes for the Department of Mathematics will, as in the past, be designed to enhance and improve strengths of the Department and to rectify and eliminate those things which are seen as weaknesses. Survey results indicate that the quality of the course offerings

is high and that, especially for upper level major courses, the relatively small class size provides for a good learning environment. Complaints about cancellation of upper level electives and a perceived lack of planning of upper level courses need to be addressed. However, a study of the surveys reveals that what is considered a major weakness in the Department is a lack of career planning. Procedures and potential actions to deal with this situation will be discussed later in this section. The changes proposed below will be divided into the areas of faculty, curriculum, and policies.

2.1 Faculty

The Department will continue to recruit highly qualified and dedicated professionals for full time tenure track positions. The Department will make every effort to attain the level of 12 tenure track faculty members over the next five years. The current volume of students in mathematics courses is more than sufficient to support this number of full time faculty members. The last 10-15 years has seen a two person decline in the size of the department with a significant increase in part time instructors. We will target some candidates with a background in applied mathematics to help with the new Applied Mathematics Concentration.

The Department will continue in its efforts to integrate the part time faculty members into the general functioning of the Department. The new physical layout of the Department offices is conducive to this effort and additional policies have been implemented to assist and encourage the overall participation of part time instructors.

2.2 Curriculum

The Department will attempt to organize and incorporate specific minors as possible concentrations to complement the mathematics major. This will better prepare students for a mathematics related career in industry and hopefully increase the number of students in the Applied Mathematics concentration which requires a minor in a science discipline. Also, the Department will continue to work with the many and varied other disciplines to meet and expand their mathematical needs and courses.

The Department will continue in its efforts to organize and publicize the rotation of upper level mathematics courses. The rotation schedule will be revised every two years based on the current needs and demands of the students. In addition, the high quality of course offerings will be maintained and the weekly scheduling of courses will be discussed to determine whether there should be a department policy regarding the number of times per week that certain classes meet.

The Department will make an effort to work together more on curriculum goals. For example, those teaching courses for future teachers will continue to meet and discuss ways to make more connections between these courses, including the possibility of using common textbooks. Another such effort that is already in motion is aligning Calculus I and II labs with the department's technology rubric. In addition, the Department has been offering more online courses recently due to an increase in demand. The plan is to continue offering such courses that have been successful and offer new online courses as needed. Last but not least,

the Department will continue to lobby for running upper division classes with low enrollment as well as keeping the service course enrollments at a manageable level.

2.3 Policies

The Department will consider the creation of a special committee during the academic year 2012/2013 to address the area of career planning for mathematics majors. Previous activities in this area will be considered for future use and regular employment. Methods of formal support and funding will be studied. One faculty member is currently looking into internship opportunities obtained through the recent alumni survey. The hope is to build long term connections with some companies in an effort to secure sustaining internships.

The Department will continue with its efforts to recruit and retain majors to all programs in the mathematics discipline and will look to increase and vary these activities. In spring 2011, the Department began administering a Change of Major survey for students switching out of the mathematics major. See Appendix 3.2. So far 8 students have completed the survey. One of the students had not taken any mathematics courses yet, another had taken 7 and the rest took between 1 and 3 mathematics courses. When asked about why they chose mathematics as a major, most mentioned that they were good at math in high school and/or wanted to teach secondary education mathematics. When asked why they were dropping the major they mentioned their own loss of interest in mathematics or increased interest in another major. Most of the students switched to majoring in Business or Criminal Justice and 3 planned on keeping mathematics as a minor. We plan to continue to look for ways to make our program more attractive and offer mentoring opportunities through the FSU Math Club.

2.4 Resources

The Department was recently moved to a newly renovated space in the same building as the Computer Science Department and the new spaces are very pleasing to all. Future renovations to the area, based on plans from the Capital Planning office, include a larger seminar room and an elevator (since we are on the third floor). New directories will be ordered soon and the Mathematics Department will continue to enhance the new spaces with useful postings and resources. Pending funding approval, the Department plans to replace the current seminar room table with a modular unit that can be broken down into smaller tables to provide a more welcoming atmosphere for students. The Department will also continue to purchase technology devices that are useful in instruction (e.g. wireless tablets and a portable camera projector).

2.5 Action Plan for the Program

Below are the Academic Plan and Vision Statement for the Mathematics Department as approved in 2008. We plan to review and revise this plan in the near future.

Executive Summary:

The mathematics department at Fitchburg State College serves many functions within the college community. Those functions include: providing education and an academic home for mathematics majors, preparing students of other majors for their chosen life paths, working with students entering the college to make certain they are prepared for the mathematics courses they need to take, and serving the college community as a whole. We strive to excel in all of these areas with our time, research and enthusiasm.

First, we are a department dedicated to our mathematics majors. We stay abreast of the needs of our students as a whole as well as of individual students and their goals. Whether our students' goals are to teach, attend graduate school, get a job in a mathematics field after graduation, or use mathematics as a foundation for logical thinking to step into another career path, our goal is to support our students in their endeavors. This involves not only providing these students with the knowledge they need to succeed in their specific goals, but also fostering a sense of belonging on campus and to the mathematics community as a whole.

The mathematics department promotes this sense of belonging among our majors on campus by supporting the activities of the mathematics club and Pi Mu Epsilon, our mathematics honor society. Students also use the seminar room to work together in close proximity to faculty, who can help guide them in their work as needed. Our office doors are always open, and students know they are always welcome to solicit a word of advice or encouragement from any of us at any time.

Often, students stop by our office with questions about what to do following graduation. We encourage our students to think about these questions early in their careers. Students who know from the beginning that they would like to work in industry will now have the option of enrolling in the new Applied Mathematics concentration. This concentration will facilitate students' pursuit of their interests by providing them with a strong mathematics background in combination with an appropriate minor field.

In addition to the focus on our majors, we strive to provide the best preparation possible for the students of other majors as they work toward their chosen life paths. Many departments on campus are working diligently to prepare their students for careers that specifically require the use of mathematics and most of those careers require more mathematics knowledge and skills now than they have in the past. A few examples of these fields are education, biology, and industrial technology.

For the past few years, we have been working closely with the education department, whose majors will soon need to pass a 40 question mathematics sub-test on the MTEL in order to earn their teaching certification. Both departments are striving to create a program that will maximize the success of their students on achieving their career goals. There are also a multitude of jobs for students in biology in the area of genetics and other mathematically intense areas of biology. Any student interested in pursuing these aspects of biology will need a strong mathematical background, and we as a department would like to be instrumental in helping these students gain the background they need. Industrial technology students also need a significant amount of mathematics for their field—in particular,

trigonometry and calculus. The mathematics department has worked closely with their department as well, and has created a calculus course specific to the needs of those students.

We also incorporate the use of technology into many of our courses. In particular, Calculus I and II both have a computer lab component. Most applied statistics courses also require the use of software in solving problems appropriate for the course material. We feel it is important that our students are given opportunities to use technology identical, or at least similar, to what they will later see in their jobs.

Another very important aspect of our role at Fitchburg State is making sure students are prepared to succeed in college level classes before they find themselves sitting in those courses. One contributing aspect to academic anxiety is to sit in a course that is required and be lost from the very beginning. We want to make sure students in all our courses have the requisite knowledge to succeed in their courses and avoid unnecessary academic anxiety. One of the main ways we accomplish this is through the Accuplacer exam and through Basic Math I and Basic Math II. It is important to our vision as a department that we continue to have face-to-face contact with students who need extra help so they feel comfortable asking questions and get the help they need.

One of our most important functions as a department is in our service to the campus community. We organize ourselves to have a presence on most committees across the campus, in order to be aware as a department of the issues the campus needs to address and is addressing. In this way, we can also participate in the solutions to these issues. In addition to this aspect of service to the college, we give and attend talks on campus, which contributes to the inter-connectedness of the faculty as a whole, and informs our work in the other aspects of our mission.

As one can see by reading our mission and vision statements, the mathematics department is committed to our majors, the students of other majors, our incoming students, and the college as a whole. We are innovative and cooperative in our work and always strive to improve ourselves and our relationships with others in the college.

Mission Statement:

The mission of the Department of Mathematics is to foster our students' self-reliance in mathematics, to produce graduates who can bring together the theory and practice of mathematics, and to create in graduates strengthened ability for critical and logical thinking.

The Mathematics Department advances the mission of the University by providing to Fitchburg State students the best possible programs it can deliver for:

- The mathematics major program
- The mathematics major leading to initial licensure as a secondary education teacher of mathematics
- The post-baccalaureate program for initial licensure as a secondary education teacher of mathematics
- The mathematics minor program

- The mathematics service courses for students in disciplines which require particular quantitative knowledge and skills
- The mathematics courses which satisfy graduation requirements of the Liberal Arts and Science Program
- The developmental mathematics program designed for students needing further preparation for college level mathematics.

Vision Statement:

Based on our departmental mission and departmental discussions on where we wish to go in the years ahead, we have compiled a list which specifies our visions as a department. These goals are roughly divided into the categories mentioned in the executive summary, but the order in which they are written in no way implies the priorities of our vision. In fact, these vision statements are very interconnected with one another, and therefore must be worked on in tandem in order to achieve our goals as a department.

The Mathematics Department should:
(Visions generally about the faculty and how we relate to others and each other)
- be a stimulating place that supports effective teachers and learners.
- be a place of strong faculty-student interaction.
- encourage the exchange of ideas and promotion of new mathematics.
- motivate its faculty to be effective, innovative and creative teachers.
- be a strong participant in the Fitchburg State community.
- be a place with a helpful, collegial atmosphere.
- make direct connections with other departments for various interdisciplinary programs.
- connect and make a difference in the local community.

(Visions about our majors)
- provide its majors an opportunity to succeed with their degree.
- contribute to the University as a whole with successful majors in Mathematics, Secondary Education and Applied Mathematics.
- expose its students to the greater mathematical community.

(Visions about other aspects of our program)
- support all other students at Fitchburg State with appropriate, effective mathematical classes.
- provide personal instruction for students requiring additional help with mathematics before they are prepared to begin college level mathematics.
- participate in more collaboration with the Math Center.

Supporting Actions:

Below we have listed a few specific actions which would help us to achieve each vision. Not all of these actions are within the power of the mathematics department on its own. It will require the cooperation of other departments on campus as well as the administration in order to be successful at addressing each of our visions.

- be a stimulating place that supports effective teachers and learners.
  - Attend conferences and lectures on teaching techniques and current research in mathematics.
  - Support the implementation of new teaching techniques to reach our wide variety of students.
- be a place of strong faculty-student interaction.
  - Have a room in the department devoted to the use of mathematics students so the students can interact with one another and have immediate access to faculty for help and encouragement.
  - Keep regular office hours that create a welcoming atmosphere for students.
  - Support activities of the mathematics club and Pi Mu Epsilon, the mathematics honor society, including activities that involve the faculty of the department.

- encourage the exchange of ideas and promotion of new mathematics.
  - Support talks given by the faculty.
  - Support, financially and logistically, talks given on mathematics or the teaching of mathematics by people outside the institution.

- motivate its faculty to be effective, innovative and creative teachers.
  - Fund faculty to attend conferences to see what other colleagues are doing in the classroom.
  - Support release time for the implementation of more intensive forms of innovative teaching including the creation of new courses and the re-vamping of current courses.

- be a strong participant in the Fitchburg State community.
  - Encourage faculty to volunteer for committees.
  - Listen to each other as we discuss what is going on in different areas of the college.
  - Give and listen to talks on campus.

- be a place with a helpful, collegial atmosphere.
  - Send emails of recognition to others for their work in the department and beyond.
  - Encourage each other as we try new things in our teaching.
  - Share successful teaching tools with each other.

- make direct connections with other departments for various interdisciplinary programs.
  - Create and build the applied mathematics program, which is an obvious bridge between the mathematics department and other departments on campus.
  - Keep working with other departments on supporting the mathematical needs of their majors.

- connect and make a difference in the local community.

- o Continue in our efforts with the Elizabeth Haskins Mathematics contest, for local high school students.
  - o Give talks at local schools.
  - o Develop a summer math camp.

- provide its majors an opportunity to succeed with their degree.
  - o Bring in speakers from industry to give students an idea, early in their career, what opportunities there are to use a mathematics major.
  - o Create courses that challenge students in a manageable way to improve their writing and logic and their knowledge and skills in the theory and practice of mathematics.

- contribute to the University as a whole with successful majors in Mathematics, Secondary Education, and Applied Mathematics.
  - o Provide secondary education majors a view of different ways to approach mathematics, both in pedagogy and in content, that they can use to help their own students succeed.
  - o Provide all mathematics majors with the foundation of the theory of mathematics necessary to build upon that knowledge as needed throughout their lives.
  - o Guide students to pursue the connections between mathematics and other fields that interest them, to help them find their own niche.

- expose its students to the greater mathematical community.
  - o Support students, financially and logistically, in attending mathematics conferences.
  - o Participate in student research.
  - o Encourage students to give talks locally and at regional and national mathematics meetings and conferences.
  - o Create new courses geared toward currently popular mathematical topics (eg. Graph Theory, Mathematical Biology, etc.).

- support all other students at Fitchburg State with appropriate, effective mathematical classes.
  - o Stay in communication with other departments as needed to be sure the needs of their majors are met—both in terms of future careers and in terms of accreditation requirements.

- provide personal instruction for students requiring additional help with mathematics before they are prepared to begin college level mathematics.
  - o Assign full time tenure track faculty to teach Basic Math courses.
  - o Keep Basic Math courses small.
  - o Make the Mathematics Placement Exam available as needed so students are able to join or register for the appropriate class as soon as possible during the semester.

- participate in more collaboration with the Math Center.
  - o Notify the math center of the names of possible tutors as soon as possible, so all students have the best possible access to the help they need.
  - o Work out a way to make the Accuplacer exam available to students when they need it so they can join or register for the appropriate mathematics course as soon as possible.
  - o Get feedback on the need for tutors, the hours specific tutors are working, and what courses these tutors are qualified to tutor.

2.6 Conclusion

In conclusion, we as a mathematics department feel we are competitive with other mathematics departments in New England. We work in conjunction with other departments on campus to address their needs, and thanks to the work of the Mathematics and the Education Department, Fitchburg State is considered a leader in the important nationwide struggle to create teachers who are prepared to give their students a strong foundation in mathematics. We have also molded students who have gone on to graduate school, mathematical fields, interdisciplinary fields, and have become excellent teachers. We would like to continue attaining these high standards. We would also like to improve in all we do, so we can continue being a leader in the Massachusetts academic community.

STUDENT DATA APPENDIX

1.   Enrollments

1.1   Majors

The Mathematics Department currently has 40 students registered as Mathematics majors. Of these, 18 are officially pursuing initial certification in Secondary Mathematics Education with several additional students indicating interest in the secondary mathematics program. Five of the remaining 22 are enrolled in the Applied Mathematics track in the department. The remaining 17 students are Mathematics majors pursuing a B.S. or B.A. in Mathematics with, perhaps, a second major in another field of study. These numbers are fluid, however, as students change majors from or to Mathematics often during the course of a given academic year.

The number of Mathematics majors has remained relatively constant at 35–40 over the past five years, as is evident from the table:

Table 1. Number of Mathematics majors at the end of the Fall term
(2006–2011)

Term	Number of majors
Fall 2006	36
Fall 2007	41
Fall 2008	41
Fall 2009	33
Fall 2010	35
Fall 2011	40

While the Department has not maintained data pertaining to diversity, nor how long it takes for Mathematics majors to graduate, the University has. This is presented later in this section.

Currently, 65% of the Mathematics majors are male, and 35% are female. The number of students (male/female) graduating with a bachelor's degree in mathematics during the six year period AY 2005/6 to AY 2010/11 is given in the following table:

Table 2. Students receiving a Bachelor's degree in Mathematics
(2006–2011)

Academic Year	Male	Female	Total
Fall 05–Spring 06	5	2	7
Fall 06–Spring 07	1	1	2
Fall 07–Spring 08	5	2	7
Fall 08–Spring 09	3	3	6
Fall 09–Spring 10	1	2	3
Fall 10–Spring 11	3	2	5

There is no discernible trend in these graduation numbers.

The University keeps records pertaining to diversity, and 6-year graduation rates of first-time full-time freshman. The "6-year graduation rate" is defined to be the percentage of students who entered in a particular Fall semester, and graduated within 6 years of their entering (with any major). These data are summarized in the tables below.

Table 3 summarizes the 6-year graduation rate for all students who entered Fitchburg State in the Fall 1998 through Fall 2005 semesters and the number of students in this group who first entered the University during those semesters as mathematics majors and their 6-year graduation rate (in any major).

Table 3. 6-year Graduation Rate
(Students entering Fall 1998-Fall 2005)
(for all students and for mathematics majors)

Entered	Number of Math Majors	6-year Graduation Rate for entering Math Majors (*graduating in any major*)	Fitchburg State 6 year Graduation Rate for all students
Fall 1998	4	100%	47%
Fall 1999	1	0%	55%
Fall 2000	6	33%	52%
Fall 2001	7	14%	47%
Fall 2002	4	50%	51%
Fall 2003	4	50%	52%
Fall 2004	13	46%	52%
Fall 2005	7	29%	47%

The Table indicates, for instance, that in Fall 2004, 13 students entered as mathematics majors, and 46% of them (i.e., 6) graduated from Fitchburg State within 6 years (i.e., by Spring 2010), though not necessarily with a major in mathematics. In comparison, for all students who entered Fitchburg State in Fall 2004, 52% graduated from Fitchburg State within 6 years.

Given the small number of students entering Fitchburg State as mathematics majors, it is difficult to draw any conclusions from these graduation rates.

The data for the 6-year graduation rate by ethnicity and gender for students who entered as mathematics majors between Fall 1998 and Fall 2005, and graduated with any major from Fitchburg State, is given in the next table.

Table 4. 6-year Graduation Rate by Race/Ethnicity
(Mathematics Majors entering Fall 1998–Fall 2005)

Race/ Ethnicity	Men			Women			Total		
	enter	grad	% grad	enter	grad	% grad	enter	grad	% grad
non-resident alien	1	0	0%	0	0	–	1	0	0%
Black	0	0	–	0	0	–	0	0	–
American Indian	0	0	–	0	0	–	0	0	–
Asian/Pacific Islander	3	1	33%	1	0	0%	4	1	25%
Hispanic	0	0	–	1	1	100%	1	1	100%
White	19	9	47%	16	7	44%	35	16	46%
Cape Verdean	0	0	–	1	1	100%	0	0	–
Unknown	3	0	0%	1	0	0%	4	0	0%
Total	26	10	38%	20	9	45%	46	19	41%

The 6-year graduation rate for these students is 41%, compared to the University average over the same period of approximately 50%.

University supplied data on gender and ethnicity for the entering classes in the Fall 2010 and Fall 2011 semesters for declared mathematics majors is shown below.

Year	Gender	White	Hispanic	More than One	Unknown	Total
2010	Male	21	1	0	1	**23**
	Female	7	0	0	2	**9**
2011	Male	21	1	1	2	**25**
	Female	9	2	0	2	**9**

University records relating to first-time full-time freshman enrollee Fitchburg State mathematics majors who returned to the University the following Fall semester are summarized below.

(N_0 = Number entering, N_1 = number returning)

**Table 5. First-time full-time Freshman Return Rate
(Mathematics Majors entering Fall 2002–Fall 2009)**

Enter in	Men			Women			Total		
	N_0	N_1	% return	N_0	N_1	% return	N_0	N_1	% return
Fall 2002	2	2	100%	2	1	50%	4	3	75%
Fall 2003	2	2	100%	2	1	50%	4	3	75%
Fall 2004	8	6	75%	5	4	80%	13	10	77%
Fall 2005	3	1	33%	4	2	50%	7	3	43%
Fall 2006	3	2	67%	5	4	80%	8	6	75%
Fall 2007	4	4	100%	5	3	60%	9	7	78%
Fall 2008	6	5	83%	6	4	67%	12	9	75%
Fall 2009	4	4	100%	3	2	67%	7	6	86%

The retention rate for freshman Mathematics majors seems to be stable at about 75%.

1.2   Minors

The number of students pursuing a minor in Mathematics is even more fluid than the number who have declared a major in Mathematics, as students (particularly in Computer Science and Middle School Education) frequently do not officially declare a minor in Mathematics until very late in their academic career. We have also recently (2010) implemented a Mathematics Minor for Early Childhood, Elementary and Special Education majors (MAMI).

Over the past five years, the number of Mathematics minors has increased dramatically, as seen in the following table

Table 6. Number of Mathematics Minors (Fall 2006–Fall 2011)

Minor	Fall 2006	Fall 2007	Fall 2008	Fall 2009	Fall 2010	Fall 2011
MATH	4	6	5	8	14	13 (prelim)
MAMI	N/A	N/A	N/A	N/A	2	6

1.3   Applied Mathematics Concentration

Mathematics majors in the Department have the option of concentrating in Applied Mathematics, which has a separate set of degree requirements from the major in Pure

Mathematics. Students have only been able to choose this option since Fall 2009, so data are sparse. We presently have 5 students registered in this program.

1.4   Enrollment in Major and Service Courses

Every student at Fitchburg State University is required to take a college-level mathematics course. In addition, students are not allowed to take such a course unless they have first satisfied the Mathematics Readiness Requirement (MRR). The MRR is satisfied by obtaining a score of 82 or higher on the Accuplacer Elementary Algebra Placement examination in mathematics, or by taking and passing our "developmental" course, *Math 0200: Basic Mathematics II*. Students who score below 50 on the Algebra Accuplacer are determined to be unprepared for Basic Mathematics II, are advised, but not required, to take *Math 0100: Basic Mathematics I*, before taking Basic Mathematics II. While students are encouraged to take the Accuplacer Test before enrolling for their first semester it is only required that they satisfy this requirement before registering for a mathematics course. Many students delay this until the latter part of their college program.

A policy implemented in Fall 2010 exempts transfer students from this requirement if they satisfied the Mathematics Readiness Requirement at another Massachusetts State Institution of Higher Education or if they transferred in a college-level mathematics class from such an institution.

Table 7 below summarizes the Accuplacer Elementary Algebra scores for students entering FSU from the Fall 2005 semester through the Fall 2011 semester.

Table 7. Accuplacer Elementary Algebra Scores

Year	Count	Mean	St Dev	Minimum	Q1	Median	Q3	Maximum
2005	980	77.331	22.979	22	61.25	78	95.00	119
2006	1196	76.255	23.710	21	59.00	77	95.00	119
2007	1066	76.772	23.388	21	61.00	77	96.00	119
2008	980	77.609	23.593	21	61.00	78	96.75	119
2009	1031	79.419	23.236	22	63.00	81	98.00	120
2010	328	80.970	23.810	21	65.00	81	101.75	120
2011	575	82.981	22.177	21	67.00	85	102.00	120
Combined Data	**6156**	**78.141**	**23.382**	**21**	**62.00**	**79**	**102.00**	**120**

As can be seen test results are remarkably consistent over this time span. While there is some evidence of a slight improvement in mean and median test scores over the last three years, the number of scores reported for students entering the University in each of the last two years who have yet to take the Placement Test are likely the explanation for this result. While students are encouraged to take the Accuplacer Test before enrolling for their first semester it is only required that they satisfy this requirement before registering for a mathematics course. Many students delay this until the latter part of their college program.

Table 8 below indicates the number and percentage of students placing into the score categories for *Math 0100* and *Math 0200* and the number and percentage of students determined to have met the MRR by scoring at the level of 82 or higher on the Accuplacer Elementary Algebra test. This latter group of students has met the prerequisite for any of the 1000-level mathematics courses offered by the Department. Again the consistency of the data over the past several years is apparent with about 14% of students placing at the *Math 0100* or Basic Mathematics I level, in the neighborhood of 40% placing at the *Math 0200* or Basic Mathematics II level, and approximately 45% ready for a 1000-level mathematics course. The seemingly higher percentage of students in the "Pass" category for 2011 is likely due to the fact that only about half of the students entering FSU in this academic year have taken the Placement Test. But it is encouraging to see the pass rate greater than 50%, the first time this has occurred.

Table 8. Mathematics Placement by Accuplacer Elementary Algebra Score
MRR Placement Levels, Basic Math I: 20 – 49; Basic Math II: 50 – 81; Pass: 82 – 120

Year	Count	Placement					
		Basic Math I		Basic Math II		Pass	
		N	%	n	%	n	%
2005	980	129	13.16	390	39.80	461	47.04
2006	1196	177	14.80	483	40.38	536	44.82
2007	1066	146	13.70	445	41.74	475	44.56
2008	980	131	13.37	396	40.41	453	46.22
2009	1031	121	11.74	398	38.60	512	49.66
2010	328	37	11.28	130	39.63	161	49.09
2011	575	55	9.57	194	33.74	326	56.70
Combined Data	**6136**	**796**	**12.93**	**2436**	**39.57**	**2924**	**47.50**

A graphical summary of the data in Tables 7 and 8 is shown below.

Beginning in 2008 the Accuplacer Arithmetic test was administered to incoming students who had chosen to major in Early Childhood, Elementary, Special Education or Middle School Education programs. The Mathematics and Education Departments had at that time begun a new mathematics curriculum for these students and were hoping that the Arithmetic Accuplacer test could help determine a base-line of elementary mathematics knowledge that would help us to better meet the needs of these students. Summaries for the Accuplacer Arithmetic scores, similar to the ones above, are given in Tables 9 and 10 below. We have yet to collect enough data to make any conclusions or decisions based on this information.

Table 9. Accuplacer Arithmetic Scores

Year	Count	Mean	St Dev	Minimum	Q1	Median	Q3	Maximum
2008	86	73.17	28.30	21	50.00	76	98.00	119
2009	84	73.89	24.52	20	57.00	74	91.00	120
2010	108	72.41	25.27	23	53.25	75	91.75	118
2011	60	76.40	28.42	26	48.50	87	102.50	120
Combined Data	**338**	**73.68**	**26.42**	**20**	**53.00**	**76**	**97.00**	**120**

As was the case for the Accuplacer Elementary Algebra test there is some evidence of higher scores in the Accuplacer Arithmetic test for 2011, but again the number of test takers may be influencing that result. While the percentage of students scoring at the highest of the three defined levels for the Arithmetic Accuplacer was very consistent at about 42% for the first three years of testing it too spiked to above 50% this year. The percentages scoring in the lower two levels have been less consistent.

Table 10. Summary Arithmetic Accuplacer Scores
Level I: 20—49; Level II: 50—81; Pass: 82—120
(Levels defined to mirror those used on the Accuplacer Algebra Test)

Year	Count	Placement					
		Level I		Level II		Pass	
		n	%	n	%	n	%
2008	86	20	23.26	30	34.88	36	41.86
2009	84	15	17.86	34	40.48	35	41.67
2010	108	25	23.15	37	34.26	46	42.67
2011	60	15	25.00	13	21.67	32	53.33
Combined Data	**338**	**75**	**22.19**	**114**	**33.73**	**149**	**44.08**

A graphical summary of the data in Tables 9 and 10 is shown below.

Many of the departments at Fitchburg State University require specific mathematics courses, and the Mathematics Department supports these requirements through its various service courses. Typically, the Department offers 30 to 40 sections of mathematics service courses each term, as well as 8 to 10 sections of courses required for the major in mathematics. The average enrollment in service courses is approximately 24, and that in major courses is approximately 10. In the following table, we give the enrollment in all mathematics courses for each academic year.

Table11. Enrollments in Mathematics courses (Fall 2000–Spring 2011)

AY	2000-01		2001-02		2002-03		2003-04		2004-05	
Fall/Spring	F	S	F	S	F	S	F	S	F	S
Service	681	524	680	573	786	567	918	676	923	760
# sections	32	25	31	27	31	27	35	30	35	35
ave/section	21.3	21.0	21.9	21.2	25.4	21.0	26.2	22.5	26.4	21.7
Major	66	75	80	87	77	94	81	103	102	121
# sections	7	8	8	9	10	10	10	10	10	11
ave/section*	10.2	9.3	10.0	9.7	7.6	9.4	8.1	10.3	10.2	11.0
total	747	596	760	660	863	661	999	779	1025	881

AY	2005-06		2006-07		2007-08		2008-09		2009-10		2010-11	
Fall/Spring	F	S	F	S	F	S	F	S	F	S	F	S
Service	973	754	979	804	981	802	1085	920	1161	950	1201	906
# sections	37	32	40	32	39	32	44	36	43	38	44	38
ave/section	26.3	23.6	24.5	25.1	24.7	25.1	24.7	25.6	27.0	25.0	27.3	23.8
Major	98	111	86	126	102	109	98	91	97	88	115	125
# sections	10	13	9	10	10	11	10	11	9	9	11	11
ave/section*	9.8	8.5	9.5	12.6	10.2	10	9.8	8.1	10.8	9.8	11.1	11.4
Total	1071	865	1065	930	1083	911	1183	1011	1258	1038	1201	906

*does not include Math 2860 (Introduction to Secondary Education), which is taught outside the department, or courses done as an independent or directed study.

The total annual enrollment in mathematics courses is given in Table 12 below.

Table 12. Total Enrollment in Mathematics Courses (Fall 2005–Spring 2011)

AY	Fall	Spring	Total
2005-2006	1071	865	1936
2006-2007	1065	930	1995
2007-2008	1083	911	1994
2008-2009	1183	1011	2194
2009-2010	1258	1038	2296
2010-2011	1316	1031	2347

As is clear from Table 12, enrollment in Mathematics courses has increased quite dramatically (about 20%) over the past five years.

1.5   Recruitment

The Mathematics Department makes extensive attempts to recruit majors in mathematics. Departmental faculty actively participate in "open house" presentations run by Fitchburg State Admissions for prospective students. Since 1980, the Department has also sponsored the Elizabeth Haskins Mathematics Contest for area high school students, which draws an average 500 participants from approximately 15 local high schools. We also send letters to incoming freshmen who have a strong mathematics background, encouraging them to take mathematics courses, and to consider a major or minor in mathematics. We recently designated two faculty members to serve as advisors to our mathematics minors. Students interested in a minor now have someone to discuss this option with, which has likely contributed to the recruitment of mathematics minors in the recent years.

The advisor of the Fitchburg State Mathematics Club visited Mount Wachusett Community College, a neighboring institution, on November 2 to give a short talk and speak to students there about becoming mathematics majors at Fitchburg State. She has been in contact with the advisor of the Math Club at MWCC, and both advisors hope to create a link between the

two clubs. According to the MWCC club advisor, there are several very good mathematics students currently studying at MWCC who would like to transfer to a four-year college after receiving their degree. This individual also organizes and proctors the American Mathematics Contest (AMC) 10/12 exam in February of each year, and with the help of another faculty member hosted the AMC 8 exam for the first time at Fitchburg State University in November 2011. Both of these exams are part of a national contest sponsored by the Mathematical Association of America. Since Fitchburg State University is the only institution of higher education in Massachusetts that offers the opportunity for Middle School and High School students to take this exam, this offers quite a bit of publicity for the university.

In addition, one of our faculty members leads a weekly Math Circle at the Fitchburg Arts Academy Middle School in Fitchburg with the help of several Fitchburg State University students. The purpose of the Math Circle is to get, and keep, children interested in mathematics. Our hope is that some of those students will one day consider attending Fitchburg State University and study mathematics here.

Informal recruitment also occurs in the classroom. If a faculty member has a particularly talented student in a service course, he or she will often encourage that student to take more mathematics courses and perhaps pursue a minor or major in mathematics. There have also been a few students in the past who have started out as mathematics minors and ended up doing a double major in mathematics and their initial field of study, with the encouragement and assistance from members of the mathematics faculty.

2.   Academic Advising

The Chair of the Mathematics Department assigns incoming students to faculty advisors so that each faculty member will have approximately the same number of advisees, subject to several informal criteria. Elementary, Early Childhood, and Middle School Education majors with a concentration in mathematics ideally have an advisor in the Education Department and a second advisor in the Mathematics Department. However, many of the Education majors rely only on the Education Department for advice. Additionally, if students request a particular member of the department for their advisor, they are generally accommodated. We have also begun advising students minoring in mathematics. All mathematics minors currently have a mathematics advisor they can go to for questions and guidance. A list of mathematics majors and their advisors is given in Appendix 4.1.

3. Assessment of Mathematics Program Effectiveness

After each pre-registration advising session, students are asked to fill out a college-wide advising questionnaire. The fall 2011 results of this assessment are given below and indicate that the students' advising experiences are generally extremely positive.

Student Informational Questionnaire on Departmental Academic Advising
Fall 2011 (13 respondents)

	None	One	Two	Three-Five	Six-Ten	Ten or More
How many sessions have you had with your advisor over the academic year?	0	1	3	8	0	0

	Less than 15 Minutes	15 to 30 Minutes	31 Minutes to 1 Hour	More than 1 Hour
How much time was spent in those sessions on average?	1	8	3	0

	Almost Always				Rarely	NA
	1	**2**	**3**	**4**	**5**	**6**
I have been able to visit my advisor when I need to.	10	2	0	0	0	
I have been able to spend as much time as I needed with my advisor.	11	1	0	0	0	0

	Strongly Agree				Strongly Disagree	NA
	1	**2**	**3**	**4**	**5**	**6**
As appropriate, my advisor places final responsibility for making decisions on me	8	3	0	0	1	0

	Extremely Positive				Extremely Negative	NA
	1	**2**	**3**	**4**	**5**	**6**
How would you rate your overall advising experience with your present advisor?	9	3	0	0	0	0

	Very Much				Not at All	NA
	1	**2**	**3**	**4**	**5**	**6**
Information from my advisor has helped me select courses.	12	0	0	0	0	0
My advisor's information about programs has helped me clarify my college plans.	6	6	0	0	0	0
My advisor's information about career opportunities has helped me clarify my career goals.	3	4	2	0	0	3
Information from advisor has helped with college requirements/procedures	10	1	1	0	0	0
I have obtained helpful information from my advisor about resources and/or services on campus	5	3	2	0	0	6

In addition, the Department administered surveys to current and former students in 2011 that included a number of questions about the mathematics program. These results are summarized in the following sections.

3.1   From the Perspective of the Current Students

In fall 2011, current students were asked to complete a survey with respect to the strengths and weaknesses of the mathematics program and individual advising experiences with departmental faculty. There were 14 students who answered the survey. A copy of the questions and responses are in Appendix 2.20 and a summary follows.

The students identified several aspects of the mathematics program at Fitchburg State University that have been a major help to them, including approachable, understanding professors who are readily available for extra help. Other students mentioned that interaction between students and professors and the professor's advising of students are strengths of the department. Many professors make themselves available way beyond their office hours, are very friendly and passionate about student success and instruction, and are willing and able to help explain things to the students in a way that they can understand it. One student also mentioned being able to find help through the tutors in the Mathematics Center and another emphasized that the small class environment is helpful.

Students were also asked to mention any particular weaknesses in the mathematics program. Several students mentioned that the Mathematics Center does not have very many tutors who are capable of tutoring the content found in the higher-level courses. One student commented that some courses are taught at a pace that is too fast, and another mentioned that some professors are not very receptive to students' problems and questions. Finally, several students commented that the courses they wished to take were either not offered or were not

offered often enough. For some courses, students may only have one chance to take the course during their undergraduate mathematics career.

When asked if they had any suggestions as to things the Department could do to make the mathematics program stronger and/or better to meet the needs of current and future students, students suggested faculty should stress the importance of and availability of the Math Center. Students also asked that some professors in the department become more receptive to their students. One student also recommended that the department create more "engineer type" programs to attract more students, which is certainly the hope for the Applied Mathematics Concentration.

Finally, students were asked if they would feel comfortable recommending the mathematics program at Fitchburg State University to another student or future student. Of those students who answered this question, nine out of eleven answered with a resounding YES! One of the respondents who did not say "yes" said "probably," and the other said they said "no" because of scheduling conflicts that arise.

3.2 From the Perspective of the Alumni

In spring 2011, the Department sent out an alumni survey with a variety of questions including those regarding their experience at Fitchburg State. The survey and responses can be found in Appendix 2.21. There were 32 alumni who answered the survey, and all percentages are based on that number of respondents. A summary of the responses is given below.

- 91% are currently employed.
- 41% went on to further education programs.
- 91% responded that mathematics plays a role in their professional life.
- 91% said they received adequate mathematical preparation for their profession at Fitchburg State.
- 97% would recommend the mathematics program at Fitchburg State.

Responders had an opportunity to make comments on their responses to some of the questions on the survey. A summary of such comments follows.

Did Fitchburg State adequately prepare you for your profession?

Most respondents interpreted this question as meaning "How" did Fitchburg State adequately prepare them. Several respondents specifically mentioned the small class sizes as helpful, and others mentioned the helpful faculty.

"The level of courses offered at Fitchburg more than sufficiently prepared me for my career as a teacher of mathematics."
"Prior to teaching, I spent a year writing software. Fitchburg more than adequately prepared me to secure this job."
"The small classes gave ample opportunity to learn directly from professors. The professors that I had were very caring and genuinely interested in the academic evolution of their students. The generally friendly atmosphere of the department made approaching professors easy and enjoyable."

What are the weaknesses in the academic program at Fitchburg State?

Almost half the respondents said there were no weaknesses. Of those who cited weaknesses, several felt that there could have been more of an effort made to explain career opportunities in mathematics, and that there should be internships in mathematics-related fields. A couple of respondents thought that a course that reviewed high school mathematics material, and more discussion of classroom management, would have made it easier for them to transition to their job as a high school mathematics teacher. There were also several complaints about upper-level courses being canceled due to low enrollment, making it more difficult for students to complete their degree.

How could the program be improved?

The responses to this question mirrored the issues raised in the previous question. In particular, a number of respondents said that the department should better make students aware of job opportunities in mathematics, and that internships should be developed with local businesses. In the same vein, several respondents said that an actuarial science program would be helpful in preparing students for jobs after graduation. There were also several respondents who thought that more effort should be made to show students the practical applications of mathematics. One respondent thought that the department should offer a master's program for teachers.

General comments

The most common comment made by responders was that they were very satisfied with the education they received as mathematics majors at Fitchburg State, several mentioning specific professors by name as having had a positive influence on them.

> "I am extremely satisfied with my mathematics education at FSC. The classes and curriculum were well paced. The department creates a student-centered environment."
>
> " My experience as an older student–graduated at 39–was an exceptional one. Gave me the confidence to go on with my career and complete my masters."
>
> "I am extremely appreciative of the education that I received from the mathematics dept. … I eventually went on to receive my masters degree from UC Berkeley in structural engineering. I can honestly say that would not have happened without the math dept at Fitchburg."
>
> " Fitchburg State was a great program, opened a lot of doors for me and I have very fond memories. … The Mathematics Department at Fitchburg State College will always hold a special place in my heart."
>
> "…I don't think I would have stuck with a math department if I had gone anywhere else. Also, my teachers were very amiable, and I still miss them a lot. I don't hear a lot of people say that about their college professors, so I feel very fortunate to be able to say it."

4.   <u>Life after Fitchburg State University</u>

Our graduating majors have gone on to a variety of jobs. According to our Alumni Database, of the 99 former students for whom we have records, about 30% have gone on to jobs in education, primarily in Massachusetts High Schools, but also in Elementary and Middle schools. The remaining alumni have jobs in a wide range of industries and professions, from actuarial science and publishing to financial services and the United States Military. In the last ten years, at least 8 of our students have gone on to graduate school in Mathematics. Our first alumnus to earn a Ph.D. in Mathematics received this in June of 2011, and another recent graduate is on track to receive his in May of 2014.

FACULTY DATA APPENDIX

THE MATHEMATICS FACULTY

Full Time Tenured or Tenure Tracked

Name	Degree	Institution	Specialties	Appt. Year	Rank
Mary Ann Barbato	PhD	University of Rhode Island	Graph Theory and Mathematics Education	2001	Associate Professor
Jennifer Berg	PhD	University of California at Berkley	Algebra	2008	Assistant Professor
Lucy Dechene	PhD	University of California-Riverside	Graph Theory Ring Theory	1978	Professor
Gerald Higdon	PhD	Lehigh University	Analysis, Probability and Statistics	1977	Associate Professor
Claire McAndrew	EdD	Lehigh University	Statistics	1983	Professor
Bruce Romano	PhD	Brandeis University	Number Theory	2009	Assistant Professor
Mark Snyder	PhD	Yale University	Mathematical Physics	1993	Professor
Peter Staab	PhD	University of Colorado At Boulder	Applied Mathematics	2006	Associate Professor
Amy Wehe	PhD	Iowa State University	Combinatorial Matrix Theory	2005	Assistant Professor
Abdulkeni Zekeria	PhD	Howard University	Analysis, Differential Equations, Applied Mathematics	1987	Associate Professor

THE MATHEMATICS ADJUNCT FACULTY

Part Time

Name	Degree	Institution
Anne Anderson	MS (Computer Science)	San Diego State University
Shawn Case	MA (Mathematics)	University of Rhode Island
Mark Charalambous	BA (Physics)	San Francisco State University
Eric Christensen	M Ed. (Mathematics)	Plymouth (NH) State University
Ronald F. Lange	PhD (Organic Chemistry)	University of Minnesota
Robert A. La Vergne	MS (Mathematics)	University of Massachusetts Lowell
Lori L. Leonard	ABD (Computing Technology in Education)	Nova Southeastern University
Michael Stassen	MA (Mathematics)	Indiana University
Kenneth A. Takvorian	MS (Mathematics)	Lowell Technological Institute
Thomas N. Weiderman	MAT (Mathematics)	Fitchburg State College

The table of part time faculty is based on fall 2011. Many of these individuals have taught for the Fitchburg State Mathematics Department in previous semesters and some are scheduled to teach in spring 2012 as well. The table below compares the number of sections taught by full time and part time faculty since the last review. The number of sections taught by adjuncts has been slowly increasing since fall 2000.   One reason for this is the fact that student enrollment has been rising but the number of full time mathematics faculty has remained between 9 and 10 during this time. The Department has been trying to increase the number of full time faculty to 11 or 12, which is where it was the last time we served over 2000 students per AY as we are now.   Our request for a new tenure track for AY12/13 was not approved but hopefully future such requests will be granted so we can properly accommodate our students without having to use too many part time faculty members.

Semester	Regular Faculty	Temporary Full Time Faculty	Adjuncts	Adjunct Sections	Total Sections	Number of Students
Fall 2006 (1 Sick Leave)	9	0	8	16	50	1067
Spring 2007 (1 Retiree)	9	0	5	11	42	930
Fall 2007	9	0	7	16	49	1083
Spring 2008	9	0	5	7	44	911
Fall 2008	10	0	7	15	54	1183
Spring 2009	10	0	4	7	47	1011
Fall 2009	9	1	7	17	52	1258
Spring 2010 (2 Sabbatical)	7	1	7	18	47	1038
Fall 2010 (1 Sabbatical)	8	1	10	20	55	1316
Spring 2011 (2 Sabbaticals)	7	1	7	18	49	1031
Fall 2011 (1 Sabbatical)	9	0	10	22	56	1265

Full Time Faculty Resumes

Part Time Faculty Resumes

Mary Ann Barbato
98 Highland Avenue
Holden, MA, 01520
(508)829-1943 (Cell)
(978) 665-3211 (Work)
msaadi@fitchburgstate.edu

EDUCATION

2001   Doctor of Philosophy in Mathematics, Ph.D.
     University of Rhode Island
     Research Area: Graph Theory
     Dissertation: Some Results on Tree-Tolerance Representations
     Advisor: Dr. Nancy Eaton

1996   Master of Science in Mathematics, M.S.
     University of Rhode Island

1994   Bachelor of Arts in Mathematics, B.A.
     University of Rhode Island

1994   Teacher Certification in Secondary Education Mathematics
     State of Rhode Island

RESEARCH INTERESTS

   Graph Theory
   Mathematics Education

TEACHING EXPERIENCE

2001-2008 **Assistant Professor of Mathematics**
2008-present **Associate Professor of Mathematics**
     Fitchburg State University Mathematics Department
     Duties: Full time teaching responsibilities, office hours, academic advising, serving on departmental and college committees.
     Courses taught: Basic Mathematics II, PreK-12 Mathematics Educators, Informal Mathematical Modeling, Finite Mathematics, Functions, PreCalculus, Mathematics Across the Curriculum, Discrete Mathematics, Discrete Workshop (for Leadership Academy students), Business Calculus, Calculus I, II & III, Introduction to Mathematical Thought, Linear Algebra, Abstract Algebra, Mathematics Seminar, Graph Theory
     Technology: Graphing calculators, Derive 5, Maple 12, MATLAB, MyMathLab

1994-2001 **Graduate Teaching Assistant**
     University of Rhode Island
     Duties: Full teaching responsibilities and weekly office hours.
     Courses: Finite Mathematics, Pre-Calculus, Applied Calculus I & II and Calculus I & II.
     Technology: Graphing calculators and Maple.

2000   **Learning Community Instructor**
     University of Rhode Island
     Chosen by Dr. Joan Peckham, University of Rhode Island Computer Science

Department.

Duties: Teaching a group of women studies majors Pre-Calculus with a
focus on computer and calculator based applications and
meeting with involved faculty from the computer science and women
studies departments.

2000   **Test Preparation Instructor**
University of Rhode Island – Feinstein College of Continuing Education
Duties: Teaching preparation courses for the Graduate Record Exam (GRE) and the Graduate
Management Admissions Test (GMAT).

1994-2000   **Learning Assistance Network Tutor**
University of Rhode Island
Duties: Tutoring all undergraduate mathematics courses and providing
students with help in improving their study skills.

1999   **Math Camp Cofounder and Instructor**
University of Rhode Island – Rhode Island Math Explorers
Duties: Recruiting students, creating advertisements, maintaining web page, designing camp
content and computer lab sessions, and planning
recreational activities.

1999   **Teaching Assistant Orientation Mentor**
University of Rhode Island
Duties: Organizing daily meetings with trainees including sample teaching
sessions in mathematics, observing and critiquing trainee
presentations, and sharing teaching philosophies and experiences.

1995   **Evening Tutor Lab Manager**
University of Rhode Island – Learning Assistance Network
Duties: Hiring and training tutors in the technical sciences, organizing
and keeping a log of tutoring sessions, and tutoring undergraduate
mathematics courses.

1994   **Student Teacher**
Narragansett High School – Mathematics Department
Duties: Full teaching responsibilities
Courses: Algebra I & II and Geometry

COMPUTER SKILLS

Derive, Maple, MATLAB, Latex, C Programming, HTML, MyMathLab, Blackboard

AWARDS

Sabbatical
Spring 2010
Activities: Observed and analyzed elementary classrooms, observed pre-service classes at Fitchburg
State University, researched teacher preparation programs.
Goal: To help perfect pre-service mathematics content courses for elementary education majors at
Fitchburg State University.

Tenure
Fitchburg State College, Spring 2007

Ruth Butler Grant
> Fitchburg State College, Fall 2005
> $1000 award to purchase a document camera projector for use in a special mathematics course for students in teacher preparation programs.

Harrod Lecture
> Fitchburg State College, Fall 2005
> $500 award for original research accomplishment and lecture presentation

Merit Bonus
> Fitchburg State College, Fall 2002
> $2,500 award for meritorious service
> Granted by Michael T. Rivard, Interim President

Robert Sine Memorial Award for Excellence in Teaching
> University of Rhode Island – Mathematics Department, 2001
> *Sponsor:* Dr. Lewis Pakula, University of Rhode Island Mathematics Department
> and Mrs. Robert Sine

2000 Promise Award
> University of Rhode Island – Women's Center
> *Sponsor:* Dr. Lewis Pakula, University of Rhode Island Mathematics Department
> *Honor:* A female graduate student who shows exceptional promise for the future.

Fellowship with the Mass Media Science and Engineering Program
> American Association for the Advancement of Science, AAAS
> *Sponsor:* American Mathematical Society, AMS
> *Duties:* Researching and writing articles for the Science and Technology department of Business Week Magazine in New York for ten weeks, 2000.

GRANTS

Massachusetts STEM Pipeline Fund: Massachusetts Department of Higher Education (DHE)Support for Mathematical Preparation of Elementary Teachers
> March 2009 – March 2010
> *Duties*: Co-creating five self contained mathematics modules to be used in elementary teacher preparation mathematics classes

Massachusetts Mathematics and Science Partnerships Program (MMSP)
> September 2004 – May 2006
> Participation in MMSP grant activities
> *Duties*: Observing professional development courses offered by affiliated company Edutron, meeting with Edutron and the Fitchburg State College Education Department to discuss ideas for improving mathematics instruction in the preparation of elementary teachers, creating and teaching new mathematics courses for students in teacher preparation programs.

ACTIVITIES

Chair of Fitchburg State University Mathematics Department
> July 2009 – present

Notebook of Practice Problems in Mathematics for new MTEL
> Summer 2008, Fitchburg State College
> Funded by Fitchburg State College Academic Affairs Department

Duties: Meeting with individuals involved in the preparation of the new MTEL, Studying new MTEL practice problems, researching sources with similar problems, creating, collecting and compiling problems comparable to the new MTEL mathematics problems into a notebook accessible to faculty for use in teaching courses designed for elementary education students.

Massachusetts Eta Chapter of Pi Mu Epsilon (PME)
National Honorary Mathematics Society
Fitchburg State College
Chapter Founder and Advisor, Fall 2007 – present
Duties: Preparing application and induction materials, recruiting student members, planning chapter activities.

FSC Math Club
Fitchburg State College
Club Advisor, Fall 2004 – present
Duties: Reviving the club after it had been inactive for several years, editing constitution, initiating, organizing and participating in club meetings and activities

Ritchey Calculus Focus Group
Boston, Massachusetts, June 2005
Hosted by Addison Wesley
Goal: For Addison Wesley and author Ritchey to obtain professors' opinions and advice on the content of a portion of Ritchey's new calculus text.

Sigma Delta Epsilon Graduate Women in Science
Boston, Massachusetts
Alpha Omega Chapter
Member & Secretary, 2002-2003

Focus Group on Calculus Texts
Boston, Massachusetts, November 2001.
Hosted by O'Donnell Associates, LLC.
Goal: For Houghton Mifflin Publishing to obtain professors' opinions and advice on content and packaging of their Calculus texts and supplements.

Graduate Student Association
University of Rhode Island
Treasurer, 1999-2000
Department representative, 1999

Graduate Student Representative, 1997-1998
University of Rhode Island Mathematics Department
Duties: Attending departmental meetings and serving as a liaison between graduate students and faculty.

Pi Mu Epsilon – National Honorary Mathematics Society
University of Rhode Island Chapter
President, 1995
Member, 1994-present

PUBLICATIONS

$K_{1,3}$ – subdivision Tolerance Representations of Cycles
submitted to Bulletin of the Institute of Combinatorics and Its Applications, June 2010.

American Mathematical Society Website: Public Awareness
Highlights of the Joint Mathematics Meetings 2001
Write ups: *Giving Your First Talk, Mathematics and Art*
Highlights of the Joint Mathematics Meetings 2002
Write ups: *What do HIV and Differential Equations Have in Common?*,
Teaching Evaluations-Friend or Foe?

Business Week Magazine-Developments to Watch
Written during the fellowship with AAAS in summer 2000.
-*Life is Sweet, Scientifically Speaking*, July 10th
-*Straight Teeth Without the Suit of Armor*, July 17th
-*Take a Hike and Charge Up your Cell Phone*, July 24th
-*These Tiny Robots go to Work in your Bloodstream*, July 24th
-*Implants for Growing Bones*, August 14th
-*Clues Toward an Arthritis Cure*, August 14th
-*Pop a Pill and Kill the Urge to Smoke*, August 14th
-*This Printer Balks at Counterfeiting*, August 14th
-*From Concept to Crystal Clear Prototype*, August 21st-28th double issue
Researched for an article on progressive geometric compression using wavelets.

PRESENTATIONS

Improving Elementary Teacher Mathematics Preparation at Fitchburg State University
Joint Mathematics Meetings of the AMS/MAA: New Orleans, Louisiana, January 2011.

3-D Graph Theory
Fitchburg State College, Pi Mu Epsilon Induction Ceremony, October 2007

Elementary Mathematics: Meeting the New Requirements (panel discussion)
2007 STEM (Science, Technology, Engineering and Mathematics) Summit: Accelerating Forward,
Sturbridge, MA, October 2007

Presentation on the Mathematical Preparation of Elementary Teachers at FSC
Worcester State College, Worcester, Massachusetts, August 2007
Hosted by Michael Winders, Mathematics Department, Worcester State College

Teacher Preparation Efforts as part of the MMSP: Massachusetts Mathematics and Science Partnership
International Symposium: Policy and Practice in Mathematics and Science Teaching and Learning in
the Elementary Grades, Beirut, Lebanon, November 2006.
(Proposal was accepted but the conference was postponed due to the turmoil in Lebanon)

Intensive Immersion – A Successful Model for Advancing Teachers' Content Knowledge
Magic in the Mountains ATMNE Fall Conference, Killington, VT, October 2006.

$K_{1,3}$ – subdivision Tolerance Representations of Cycles
Joint Mathematics Meetings of the AMS/MAA: Atlanta, Georgia, January 2005.

Math and Cellular Networks: What's the Connection?
Fitchburg State College, Fitchburg, Massachusetts
Given at the following three events: I^3 (Intensive Immersive Institutes) Conference for Teachers of
Mathematics, Leominster, MA, March 23, 2005; Fitchburg State College 25th Annual Elizabeth
Haskins Mathematics Contest on May 6, 2005; Fitchburg State College Mathematics Department
Seminar, December 2004.

Aster Tolerance Representations for Cycles

Joint Mathematics Meetings of the AMS/MAA: Baltimore, Maryland, January 2003.

Tree-Tolerance Representations for Trees
Joint Mathematics Meetings of the AMS/MAA: San Diego, California, January 2002. This presentation was also given at Rhode Island College as an invited address to the mathematics faculty and students, Rhode Island, November 2001.

A Restriction on Tree-Tolerance Representations for Cycles
Joint Mathematics Meetings of the AMS/MAA: New Orleans, Louisiana, January 2001. This presentation was also given at the Fall Meetings of the Northeastern section of the MAA: Providence College, Providence, Rhode Island, November 2000.

Set Representations for Digraphs
31st Southeastern International Conference on Combinatorics, Graph Theory, and Computing: Florida Atlantic University, Boca Raton, Florida, March 2000.

CONFERENCES & MEETINGS

New England Educational Assessment Network (NEEAN) Fall Forums
November 2009 and 2010.
The Teaching Professor Conference
Boston, MA, May 2010.

Hudson River Undergraduate Mathematics Conference
Union College, Schenectady, NY, April 2009. Moderated a session.

Joint Mathematics Meetings of the AMS/MAA
San Diego, California, January 2008
San Antonio, Texas, January 2006
San Diego, California, January, 1997

The Mathematical Preparation of Elementary Teachers
Worcester State College, Worcester, Massachusetts, March 2007
Hosted by Richard Biske, Mathematics Department Head, Worcester State College

College Ready Mathematics Standards Alignment Meeting
Middlesex Community College, Lowell, Massachusetts, April 2006
Hosted by the Massachusetts Department of Education and Board of Higher Education

Improving Student Learning Through Assessment
Workshop presented by Dr. James O. Nichols & Karen W. Nichols
Fitchburg State College, November 2006.

Discussion on Transferability of Mathematics Requirements for Massachusetts BHE Early Childhood Education and Elementary Education Compacts
Mount Wachusett Community College, Gardner, Massachusetts, December 2005.

Hudson River Undergraduate Mathematics Conference
Williams College, Williamstown, Massachusetts, April 2005.

MathFest 2004
Providence, Rhode Island, August 2004.

Northeastern Section of the MAA
  Worcester Polytechnical Institute, Worcester, MA, November 2004
  Roger Williams University, Bristol, RI, June 2004
  Providence College(dinner talk), Providence, RI, April 2004
  Wellesley College, Wellesley, MA, November 2003
  Western Connecticut State University, Danbury, CT, November 1998

Graduate Women in Science Annual National Meeting
  Washington, DC, June 2002.

MATLAB Day at Harvard University
  Boston, Massachusetts, May 2002.

Discrete Math Day at Dartmouth College
  Hanover, New Hampshire, May 2002.

Combinatorists of New England (CONE)
  Smith College, Northampton, Massachusetts, February 2001, February 2000,
  April 1999.

PROFESSIONAL MEMBERSHIPS

  The Institute of Combinatorics and its Applications, ICA
  Mathematical Association of America, MAA

Employment	Assistant Professor, Fitchburg State College,

<div align="right">hired September 2008</div>

co-Director Center for Teaching and Learning, Fitchburg State College,

<div align="right">June 2009–August 2011</div>

Education	**University of California at Berkeley**, Ph.D, May 2008

On the Center of $q(n)^{(2)}$ Supervisor: Vera Serganova

University of Montana , B.A., 1999
Mathematics major and Philosophy minor
Graduated as a University Scholar from the Honors College

Teaching	**Fitchburg State University**

Courses taught

- Math 1250: Introduction to Functions
- Math 1700: Applied Statistics
- Math 2300: Calculus 1
- Math 2500: Introduction to Mathematical Thought
- Math 4050: Topology

- Math 1500: Informal Number Theory
- Math 2000: Informal Geometry
- Math 2400: Calculus 2
- Math 3900: Mathematics Seminar

Methods used:
- · Smart-board electronic lecture notes (Math 1500, 1700, 2400)
- · Worksheets designed with examples for group work (Math 1250, 1500, 1700, 2300, 2400, 2500)
- · Lab–centered courses taught with the discovery method (Math 2000)
- · Written projects (Math 1700, 2000)
- · Technology based projects or labs (Math 1700, 2300, 2400)
- · Pre-lecture quizzes administered on Blackboard (Math 1500, 1700, 2400)
- · Weekly homework and quizzes (in all classes)
- · Student led seminar (Math 3900)
- · Oral examinations (Math 4050)

University of California at Berkeley
- · Summer Session Lecturer,
  Math 1A – *Calculus A: Limits and Differentiation* , Summer 2006, 2004;
  Math 1B – *Calculus B:Techniques of Integration, Sequences and Series, Introduction to Differential Equations*, Summer 2007, 2005, 2003
  - Responsible for lecture and recitation of eight week condensed Calculus course
  - Set homework assignments, quizzes, tests, and grading scheme
  - Designed numerous worksheets for group work in recitation and lecture notes for students
- · Graduate Student Instructor, Math 74 – *Introduction to Proofs*, Spring 2005, Fall 2004
  - One of two graduate students selected per semester to lecture this course
  - Designed syllabus and chose appropriate textbook
  - Set homework assignments, quizzes, tests, and grading scheme

Teaching(continued)   **University of California at Berkeley** (continued)

· Graduate Student Instructor, Math 300 — *Pedagogical workshop*, Spring 2004, Fall 2002
  - Only graduate student selected to lecture this course
  - Designed bi-weekly activities for first–time graduate student instructors
  - Coordinated with university pedagogical resources to meet or exceed university regulations (regarding teacher training and Title IX compliance)

· Graduate Student Instructor, Math $1B$ — *Calculus B: Techniques of Integration, Sequences and Series, Introduction to Differential Equations*, Spring 2002, Fall 2001
  - Lead recitation sections
  - Varying level of responsibility dependant upon lecturing professor

University of Montana - Missoula

· Undergraduate Teaching Scholar, Math 107 — *Contemporary Mathematics: An Introduction to Mathematical Ideas and their Impact on Society*, Spring 1999
  - Designed section on probability in games of chance
  - Lead section on symmetry groups with hands–on construction of the regular polygons

Awards

· Assessment Tk20 mini-grant, Spring 2010

· Research Training Grant in Representation Theory, Geometry and Combinatorics, 2005-2007

· Julia Robinson Fellowship, Spring 2001

· VIGRE Grant, Fall 1999, Spring 2000

Conferences

· Joint Mathematics Meetings

     January 2011:· Invited to present talk   *"Using Rubrics for Calculus 2 Maple Labs"*

     January 2010:· Invited to present talk   *"An Assessment Loop: or How I Learned to Stop Worrying and Love the Rubric"*

     ·Participated in "Become a Catalyst for Change in Statistics Education" workshop

     · Panelist on Springer's Young Mathematicians' Roundtable

     January 2009: Invited to present talk on research by Association for Women in Mathematics *"On the Casimir Fields of $q(n)^{(1)}$ "*

· Mathematics Association of America, North Eastern Sectional Meetings:

     November 2010 (Providence College)

     November 2009 (Western New England College)

     November 2008 (Bentley University)

· Mathematics Association of Colleges for Teacher Education

     October 2010 · Invited to present talk *" Meeting the Mathematics Need of Future Teachers"*

· North East Education Assessment Network Fall Forum:

     November 2010

     November 2009

     November 2008

     · November 2009: Invited to present talk (joint with Director of Assessment Stephen Wall-Smith)
     "How Courseware Can Shape the Assessment Process"

Conferences(cont.)

- North East Education Assessment Network Summer Annual Academic Assessment Institute, June 2011
- Critical Friends Group Coaches Training, Fitchburg State University, June 2011
- Bridging Engineering Science, and Technology Education Workshop, Museum of Science, Boston MA, June 2011
- Elementary Pre-Service Teachers Mathematics Project, Boston University School fo Education, June 2011
- Controlled Management of Meaning Workshop, Fitchburg State University, April 2011
- Hudson River Undergraduate Mathematics Conference:
  - April 2010 (Keene State College)
  - April 2009 (Union College)
  - April 2009: Invited to present talk   *"Tessellations, the Conway Criterion and Heptaimonds"*
- TK-20 User's Conference — May 2009
- Lie Algebras, Vertex Operator Algebras and their Applications: North Carolina State University — May 2005
- Representations of Kac-Moody Algebras and Combinatorics: Banff International Research Station — March 2005
- Fall Teaching Conference for Graduate Student Instructors: University of California Berkeley - workshop leader — August 2004
- Lie Groups, Lie Algebras and their Representations;
  - January 2005 — University of California Berkeley
  - October 2004,— University of California Riverside
  - October 2003 — University of California Santa Barbara

Professional Activities

Fitchburg State University

- co-Director the Center for Teaching and Learning, June 2009 —August 2011
  - Coordinated New–Faculty Mentoring Program   — co-Chaired Advisory Board
  - Designed Student survey on Use of Instructional Technology   — Organized Summer Institute
  - Organized Events: · Instructional technology sessions   — Oversaw Innovation grants
    - Teaching Circle (spring 2011)
    - Pedagogical Seminar Series
    - Forum on the Future of the University
    - Book Signings
    - Connections between Faculty, Librarians, and Administrators
- NEASC Standards 4 & 5 sub-committee (co-Chair)
- All College Curriculum Committee: AY 10/11, 09/10
- Center for Teaching and Learning Advisory Board: AY 08/09
- Liberal Arts and Sciences Assessment Workgroups
  - Problem Solving Goal of the LA&S program: AY 10/11, 09/10, 08/09,
  - Communication Goal of the LA&S program: AY 10/11, 09/10
- Student Organization Committee AY 10/11
- First Year Experience Mentor: Fall 2009

Professional Activities (cont.)

Fitchburg State University

- Mathematics Department Committees
  – Assessment Committee (Chair): AY 10/11, 09/10, 08/09
  – Hiring Committee: AY 10/11 Summer 2009
  – Curriculum Committee: AY 09/10, 08/09
  – Contest Committee: AY 09/10 , 08/09

- Developed Peer–tutoring Program with Fitchburg Arts Academy (5th, 6th, 7th, and 8th grades): Spring 2010

North East Section Mathematical Association of America
- Organized Undergraduate Math Competition: Fall 2010 and 2009

University of California at Berkeley
- Course Committee Member Fall 2006 – Spring 2008

Local Talks

- "Creative Teaching Methods" –25 August, 2010 CTL Summer Institute

- "New Faculty Introduction to the CTL" – 25 August, 2010 CTL Summer Institute

- Problem Based Learning" – 24 August, 2010 CTL Summer Institute

- "Report on student survey regarding Educational Technology" – 23 August, 2010 CTL Summer Institute

- "A Glimpse into a Mathematician's World" – 1 Feburary, 2010 FSC Speaker's Series

- "Using Blackboard's grade center" – 30 November, 2009 and 7 May, 2010 CTL Instructional session

- Using Smartboard in your classes – 16 November, 2009 CTL Instructional session

- "Creating and Deploying your own student evaluation forms on Blackboard" – 30 September, 2009 CTL Brown-bag with Peter Staab

- "Discussion on the article "Best Practices: Preventing and Managing Challenging Classroom Situations" by Deb Wingert and Tom Molitor from Currents in Teaching and Learning Vol.1 No. 2" –16 September, 2009 CTL Brown-bag

- "A User's Introduction to Tk-20" – August 17, 2009 CTL Summer Institute

- "End of Year Reflections: What Worked, What Didn't, and What We'd Like to Try Next Time" – May 6, 2009: CTL Brown–bag with Sean Goodlet

- "Counting Squares" – April 15, 2009: Math Circle

- "Making Connections Across the Academy" – March 19, 2009: Brown–bag with Jon Krasner on cultivating interdisciplinary connections

- "Your Vote Counts?" – October 29, 2008: talk with P. Staab on the mathematics of voting (used "clickers" for audience participation)

Reference

Professor Mary Ann Barbato
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NAME: Dechéne, Lucy Irene   DATE: Oct 2, 2011
ADDRESS: 31 Fitch Hill Avenue   TELEPHONE: H 978-343-9355
         Fitchburg, Massachusetts 01420   Wk 978-665-3077

TEACHING EXPERIENCE:

1995-   **Professor**, Department of Mathematics,
               Fitchburg State University, Fitchburg, Ma.

1995-1996   **Faculty Research Associate**, Fitchburg State College

Spring, 1994   **Honorary Research Fellow**, Department of Mathematics, University of Sussex, Brighton,
               England and Honorary Visitor, Department of Mathematics, Loughborough University of
               Technology, Loughborough, England

1984-1995   **Associate Professor**, Department of Mathematics,
               Fitchburg State College, Fitchburg, Ma.

1978-1984   **Assistant Professor**, Department of Mathematics,
               Fitchburg State College

Fall, 1977   **Community Teaching Fellow**, University of California,
1973-1976   Riverside, California

1976-1977   **Teaching Assistant**, Department of Mathematics, U.C. Riverside

Summer, 1976   **Associate in Mathematics**, U.C. Riverside

Music:

1980-1981   **Carillon Instructor**, Department of Music, Smith College,
               Northampton, Ma.

1975-1976   **Private Instructor in piano, organ and carillon performance**

GRANT
One of two Fitchburg State College Math Dept. investigators for 2009-2010 **Massachusetts STEM Pipeline
Fund Support for Mathematical Preparation of Elementary Teachers grant** from the Dept of Higher
Education of the Commonwealth of Massachusetts. We wrote five modules for professors of preservice
elementary teacher preparation courses. The grant is in partnership with Middlesex Community College Math
Dept. and Fitchburg Public Schools.

ADMINISTRATIVE EXPERIENCE:

2002-2004   **Graduate Program Chair** M.A.T. Mathematics Fitchburg State College
1998-2001

2002-2004   **Director Post-Bac Initial Licensure Program** Mathematics

2002-2003   **Director**, Mathematics Center at Fitchburg State College
1994-2001
1990-1993

Spring, 1987   **Acting Chairperson**, Department of Mathematics,

Fitchburg State College

SPECIAL MATHEMATICS BACKGROUND

Outcomes Assessment

Paid my own way to/for a minicourse "Writing a Departmental Outcomes Assessment Plan" for Mathematics Departments in 2005. I did this because I had written many departmental assessment plans in response to requests by the Administration starting in 1993, but they were all rejected without helpful comments. As a result of the course I finally understood what such a plan *was*. I then authored the plan which was ultimately accepted by my department after a year of debate.

Spent a year with my chair strategizing about getting the plan through our department. We finished this and the two of us started trying to implement the plan in Fall 2006. Finally, in Fall 2008 we got several younger faculty interested in assessment and we have made good progress. Already we are making some useful changes to how we teach as a department that even the "anti-assessment" persons feel are good.

Program Reviews

I have been heavily involved in the writing of our departmental reports for outside program reviews starting about 1980. I wrote the report for the outside program review of our Mathematics Readiness program in 2008.

Mathematical Readiness

I first brought up the need for mandatory placement exams in Spring 1979. After years of relentlessly bringing this up in the department, another (male) colleague became convinced of its necessity and people were more willing to listen to him. So I worked hard in the background and let him take the spotlight. By Fall 1985 we had gotten a measure through the ACC with the strong support of the entire FSC faculty (but strong opposition by President Mara) for a Readiness Program in mathematics and English. Dr. Mara set some strict conditions about how the mathematics plan was to be implemented. We used all of our Operations Research skills and came up with a workable plan that was far from ideal (105 remedial students as *half* of a full-time load.) I was acting Chair of the Mathematics Department in Spring 1987—the semester before the program started. It was an uphill battle since Dr. Mara created difficulties at every step, but I did have everything worked out and in place for entering freshmen of Fall 1987. I was the first person to teach Basic Math I (arithmetic) under the new system and I did it both semesters of AY 1987-88. After that I rotated through Basic Math II (algebra) as the rest of the department did until our most recent VP for Academic Affairs decided full-time faculty were not to teach it.

In the 1990's our Readiness Program was used a model for all the public institutions of higher education in Massachusetts. I have continued to be heavily involved in Readiness since 1979.

Authored the 2008 report for the outside review of our Mathematics Readiness Program requested by our VP for Academic Affairs.

Director, Mathematics Tutorial Center from 1990-2003 (except for sabbatical periods.)

Elementary Education

1973-78 As a Community Teaching Fellow at the University of California Riverside, I taught enrichment mathematics to mostly Hispanic children of migrant farmworkers in local elementary schools using the discovery method. These were normal elementary school classes, not accelerated classes.

1978-1983(?) Taught Methods and Materials in Mathematics Education for Elementary School every semester until the course was taken back by the Elementary Education Department.

1998-99 Spent a year developing all the discovery materials needed to teach Informal Geometry as a discovery-based course for elementary education majors. The course had last been taught about 1983 and we had no materials for it. I designed it specifically for k-9 future teachers of mathematics.

1999-   Taught the Informal Geometry course every semester except for sabbatical leave periods. Starting in 2008, the course was one of three courses required for elementary ed majors. It has become a very popular course for Communications Media students over the last ten years. So we have not restricted enrollment to education majors.

2007-2008 Taught the last three semesters of Mathematics Across the Curriculum—the former required mathematics course for elementary education majors.

2009-2010 Grant from the Dept of Higher Education of the Commonwealth as mentioned above to develop online materials for preservice elementary ed courses.

Middle School Education
Developed Informal Geometry course to be appropriate for 6-8 as well as k-6 teachers

2000 -   Advisor to Middle School Math Certification majors

2007-8 Involved in the redesign of the Mathematics middle School Certification program

Secondary Education
Mathematics MAT—I was director of the program when we accepted the first students and I was director when we had to usher the last students out due to lack of enrollment. We decided to hold the line on prerequisites and expect at least a minor in mathematics before acceptance into the program. This lowered the potential enrollment pool too much to keep the program viable. I supervised *all* of our MAT candidates in the field and directed their theses while the program operated.

NCATE report: I wrote the NCATE report for accreditation of the MAT. Even though the program has been suspended, we have NCATE and state accreditation for Mathematics Secondary Professional Licensure through Spring 2010.

Mathematics Postbac Program—I directed the Mathematics Initial Licensure in Mathematics Postbac Program for its first two years. Supervised two initial licensure candidates.

Secondary Education Unit—even though I'm no longer actively doing student teacher supervision in secondary education, I'm still an active participant in the Secondary Education unit at Fitchburg State College and I act as a back-up person for mathematics secondary education in my department.

Technology
Designed and taught the Discrete Algebraic Structures class at the request of the Computer Science Department Spring 1979. Taught many times thereafter.

Pioneered the use of the computer in Calculus I. Later this grew into formal labs for Cal I and Cal II.

Pioneered the use of technology assignments in Linear Algebra, Operations Research, Finite Mathematics, Cryptography and Abstract Algebra.

Independent Study and Presentations by Students
Supervised 27 independent study students since 1978
Pioneered sending students to give presentations at off-campus conferences and supervised all FSC presenters except for one from 1991-2007

MATHEMATICS COURSES TAUGHT:

Basic Math I	Finite Math	Elementary Stat
Basic Math II	Functions	Applied Stat I (Nursing major section)

Intro to Math   Precalculus   Methods and Materials in Elementary Mathematics
Mathematics Across the Curriculum   Informal Geometry   Calculus for Business
Calculus I   Intro to Mathematical Thought   Mathematical Logic
Calculus II   Linear Algebra   Abstract Algebra
Number Theory   Operations Research   Discrete Algebraic Structures
Topics in Abstract Algebra II   Topics in Graph Theory
Grad-level Abstract Algebra   Grad-level Discrete Algebraic Structures   Grad-level Galois Theory
Grad-level Practicum in Secondary Education   Grad-level Internship in Secondary Education

CONSULTING:
Jan.-May, 1983 Vanguard Lion Associates, St. Louis, Mo.

CALIFORNIA CREDENTIAL:
Community College Instructor Credential (Life)   (Mathematics, Music with approval of the district governing board)

EDUCATIONAL TRAINING:

1973-1978 University of California Riverside   Major: Mathematics   Degrees: **Ph.D.** 1978   **M.S.** 1975
          Dissertation: ***Adjacent Extensions of Commutative Rings***   GPA: 3.80

1969-1973 University of San Francisco   Major: Mathematics   Minor: Music
          San Francisco, Ca. 94117
          Degree: **B.S. Magna Cum Laude** 1973   GPA: 3.82
          Elected to Alpha Sigma Nu, Jesuit University Honor Society 1972

1969-1973 Lone Mt. College   Minor: Music (Organ performance)
          San Francisco, Ca. 94118   (Special student from USF)

RESEARCH, STUDY AND PRESENTATIONS:
Studied MAPLE and developed labs for Number Theory, Cryptography and Precalculus while on sabbatical Spring 2011.

Invited by Peter Staab to give the first presentation in the freshman Applied Mathematics Seminar, Spring 2011. My topic was "**The Cookie Delivery Problem**", detailing my experiences as a mathematical consultant.

Took American Math Society short course "Computational Topology" from Jan 4-5, 2011 in New Orleans, LA.

Took minicourse "Geometry and algebra in mathematical music theory" at the Joint AMS-MAA Meetings in New Orleans, Jan. 2011.

Gave a paper "**Informal Geometry for Aspiring TV/Film Directors and K-8 Educators**" at the Mathfest, Pittsburgh, PA in August 2010.

Took minicourse "Mathematics of Perspective Viewing in Art" at the Mathfest, Pittsburgh, PA in August 2010.

Gave presentation at the FSU Center for Teaching and Learning "**Learning through Writing**", Aug 20, 2009.

Participated in Workshop to Improve the Teaching of Abstract Algebra, Mathfest , Portland OR Aug 2009.

Took minicourse "Data Mining" at the AMS-MAA Joint Meetings, Washington, DC Jan 2009

Took minicourse "The ubiquitous Catalan numbers and their applications" at Mathfest, Madison, WI Aug 2008.

Took 2-day short course "Implementing Biology across the Mathematics Curriculum" at the Mathfest, San Jose, CA Aug 1-5, 2007.

Took minicourse "Infusing Connections into Core Courses for Secondary Teachers" at the Mathfest, Knoxville TN Aug 10-12, 2006

Invited panelist/presenter for national Project NEXT fellows, "**Creating and Re-creating Mathematics Courses**" Mathfest Knoxville TN Aug 9, 2006.

Took minicourses "Teaching a Course in the History of Mathematics" and "Geometry with History for Teaching Teachers" at the Mathfest, Albuquerque, New Mexico August 4-6, 2005.

Took mincourses "Writing a Departmental Outcomes Assessment Plan", and "Teaching Galois Theory to Undergraduates," AMS-MAA Joint Meetings, Atlanta, GA Jan. 2005.

Gave a presentation "**Careers for Mathematics Majors**" at the FSC Career Fair, Fall 2004.

Took minicourse "Graphs for Modeling Large Structures and Rigid Structures," Mathfest Providence Rhode Island, Aug. 12-14, 2004.

Participated in the Chautauqua course, "The Geology of the California Gold Rush Country", The Sierras, California June, 2004.

Gave a talk at the FSC Elizabeth M. Haskins Mathematics Contest to high school students, "**Careers Using Mathematics**". A copy of the Powerpoint was requested by the Director of Admissions at FSC and used by her staff later. April, 2004. An updated version has been used by the Math Dept. at Open Houses since then (2004--).

Gave invited address, "**A Tintinnabulous Introduction to Group Theory: The British Sport of Change Ringing**", Framingham State College, February 2004.

Gave invited hour address to the Northeastern Section of the MAA (only FSU Mathematics Department member ever invited to do so) "**A Tintinnabulous Introduction to Group Theory: The British Sport of Change Ringing**", Fall Sectional Meeting, Wellesley College, Wellesley MA Nov 22, 2003.

Participated in the Chautauqua course "New Directions in Bioinformatics and Biotechnology Workshop" at Rensselaer Polytechnic Institute, Troy, NY July 23-25, 2003.

Radio interview on the Al Verona show, radio WICN Worcester. Sept. 2002. Topic was the Chronic Fatigue Syndrome and my research.

Studied group presentations theory, group representation theory, and chemical graph theory as well as furthering my knowledge of fractals and 3-D rotations of solids during sabbatical 2001-2002.

Learned to use PowerPoint, Excel, Mathematica 4.0, Geometer's Sketchpad, MathCAD and furthered my knowledge of Matlab during sabbatical 2001-2002.

Developed homework and lab exercises with Excel for Finite Mathematics and Functions. Developed PowerPoint presentations and multicultural homework/lab exercises with Geometer's Sketchpad for Informal Geometry. 2001-2002.

Was invited participant in Quantitative Environmental Learning Project at Seattle Central Community College, Seattle, WA June 17-20, 2002 (and got Dan Robinson of Chemistry invited to attend with me).

Took minicourses "Incorporating Discrete Mathematics in the Preparation of K-12 Mathematics Teachers" and "Using Excel in Advanced Mathematics Courses" at the AMS/MAA Annual Meeting in San Diego, Jan. 2002.

Participated in workshop on Islamic Art at Mathfest in Madison Wisconsin, Aug 2001.

Took minicourses on the use of geometry in abstract algebra proof, and experimental informal geometry at the Mathematics of the New Millennium Meeting and MAA Mathfest Meeting at UCLA, 2000.

Member of the U.S. Women Mathematician's People-to-People Delegation to Russia May, 1998

Co-authored an on-line course for Basic Math II with C. McAndrew, Chair; C. Cosgrove, B. Light, E. Fandreyer and A. Zekeria of the FSU Mathematics Department.

Presented three research papers at the national meeting of the American Mathematical Society, Jan. 1997 in San Diego:
"Ringing a Peal - an Aural Permutation Group," "Illness Progression Graphs for Long-term Chronic Fatigue Syndrome," and **"Pattern Analysis of Long-term Chronic Fatigue Syndrome Illness Progression Graphs."**

Chosen to give a Harrod lecture "**The 10+ Long-term Chronic Fatigue Syndrome Study: A Portrait of Courage**" on Oct. 30, 1996.

Gave a presentation "**The 10+ Chronic Fatigue Syndrome Study and the U.N. Women's Conference in Beijing**" at Sonia Kovalevsky Day at Riviere College, 1996.

Poster presentation "**An Analysis of Long-term Chronic Fatigue Syndrome Illness Progression Graphs**" co-authored with Fred Friedberg, Maggie McKenzie and Robert Fontanetta at AACFS International Conference in San Francisco, Jan. 1996. I was lead author and defended the poster.

"**An Analysis of Long-term Chronic Fatigue Syndrome Illness Progression Graphs**" co-authored with Fred Friedberg, Maggie McKenzie and Robert Fontanetta. Presented at the U.S.-China Women's Issues Conference, Aug.29, 1995 in Beijing, P.R.C.

Member of the U.S. Women Mathematicians Delegation to the U.S.-China Women's Issues Conference and the opening of The U.N. NGO Conference on Women, August 1995 in Beijing, P.R.C.

"**Symptom Patterns and Illness Progression in Long-term Chronic Fatigue Syndrome**" co-authored with Fred Friedberg, Maggie McKenzie and Robert Fontanetta. Actual oral platform presentation was by Fred Friedberg of SUNY Stony Brook at the 1994 American Association for Chronic Fatigue Syndrome Research and Clinical Conference, October 7-10, Ft. Lauderdale.

"**A New Fatigue Typology for Chronic Fatigue Syndrome**" co-authored with Fred Friedberg, Maggie McKenzie and Robert Fontanetta. This was a poster presentation at the conference above and I was lead author and the person defending the poster at the session.

Studied multivariate and non-parametric statistics, consulted with a biostatistician at the SUNY Stony Brook Medical School and studied numerical analysis techniques from June, 1994 to 1996 in order to analyze the data of our CFS Study mentioned above.

"**Chronic Fatigue Syndrome: Influence of Histamine, Hormones and Electrolytes**" was a poster I presented at the International Chronic Fatigue Syndrome Conference in Dublin, Ireland from May 18-20, 1994.

Studied physical and quantum chemistry, group representation theory and advanced linear algebra and graph theory from 1992 to the current time while working with Christine Cosgrove on the study of mathematical questions concerning buckminsterfullerene and other fullerene molecules. We also learned how to use the computer algebra system program MATHEMATICA.

Participated in a Mathematics Department seminar on DERIVE and other computer programs suitable for use with our mathematics students. I developed some laboratory exercises suitable for use in the classroom. 1993

Gave a talk with Christine Cosgrove on "**Groups, Graphs and Fullerenes**" for the Western Regional Dinner Meeting of the Northeastern Section of the Mathematical Association of America, March, 1993.

Gave a workshop for high school teachers on "**Why Do We Need to Know This Stuff?**" for Sonia Kovalevsky Day at Riviere College, Nashua, N.H. on April 10, 1992.

Took a short course in **New Scientific Applications of Geometry and Topology**, American Mathematical Society (AMS) Meeting, Baltimore, MD in Jan. 1992.

Talked on "**Adjacent Commutative Rings**" to the Fitchburg State Computer Science/Mathematics Club on Nov. 13, 1991.

Took a short course in **The Unreasonable Effectiveness of Number Theory**, AMS Meeting, Aug. 1991.

Took a short course in **Probabilistic Combinatorics and Its Applications**, AMS Meeting, Jan. 1991.

A member of the People-to-People Citizen Ambassador Women in Management Delegation to the USSR in June, 1990. Studied education and problems of women in the USSR.

Gave a high school student workshop on "**Error-correcting Codes: Erasing Mistakes from Outer Space"** for Sonia Kovalevsky Day at Riviere College, Nashua, N.H. on March 16, 1990.

Took a short course in Mathematical Questions in Robotics, AMS Meeting, Jan. 1990.

Presentation to high school students on "**Careers Using Mathematics** " for Sonia Kovalevsky Day at Riviere College, Nashua, N.H., March, 1989.

A member of the People-to-People Citizen Ambassador Women in Management Delegation to the People's Republic of China in June, 1988. Presented a paper on "**The Status and Participation of U.S. Women in Science**" at Hangzhou University, Hangzhou, P.R.C.

Gave a talk with Joanne Kendall of Middlesex Community College on "**Math Labs: What, Where, When and How**" for the New England Mathematical Association of Two Year Colleges Annual Meeting, Bristol Community College, Fall River, March 12, 1988.

Took a short course in Computational Complexity Theory, AMS Meeting, January 1988.

Took minicourses in Mathematical Modeling and Discrete Mathematics Using ISETL, AMS Annual Meeting, January 1988.

One of 38 delegates chosen from throughout the United States to be part of the American Women in Management People-to-People Citizen Ambassador Delegation to the People's Republic of China sponsored by the China Association for Science and Technology in August 1987. We studied the education and problems of women in China.

Participated in the Writing Conference sponsored by the English Department of Fitchburg State in June 1987.

Took a one-week course in Graph Theory and Linear Algebra at the University of Minnesota, Duluth in June 1987.

Interviewed on the Adams Russell Cable TV station about histamine and the postviral fatigue syndrome on May 28, 1987.

Chosen to give a Harrod lecture in April 1987 on "**The Unsuspected Role of Histamine in Chronic Disease**."

Took a short course on Applied Linear Algebra at U of Maine Orono (1986)

Presented the paper "**Adjacent Rings**" to the International Congress of Mathematicians, University of California Berkeley, August 1986.

Presented an in-service workshop **"New Developments in Mathematics"** to faculty of No. Framingham High School (1986)

Presentation "**Careers Using Mathematics"** for Sonia Kovalevsky High School Mathematics Day sponsored by the Bunting Institute at Radcliffe (1985)

Speaker for Career Day at Masconomet Jr. High (1984, 1986), Norwell H.S. (1983), Matignon H.S. (1983) and Lawrence H.S. (1983)

Panelist and Workshop giver- Career Day for High School Women sponsored by American Association for University Women in Plymouth, New Hampshire (1983)
Workshop presenter for Career Day at Northfield- Mt. Hermon School (1983)

Took AMS short course on Graph Theory and Coding Theory (1981)

Participated in a seminar on "Microprocessors and Microcomputers" (1981)

Took the NSF Chautauqua Course-"Strategies for Improving the Participation of Women in Mathematics" (1981)

Studied graph theory and coding theory on my own (1980-)

Presented the 2nd FSC Harrod lecture in April 1979 *Adjacent Rings: An Intro for Ordinary Mortals*.

Presented a paper "**Adjacent Rings**" to 1979 Annual Meeting of American Mathematical Society

PUBLICATIONS:
"**Mitochondrial Dysfunction, Post-exertional Malaise and CFS/ME.**" Published by the Massachusetts CFIDS/ME & FM Association online April 2011 at http://www.masscfids.org/resource-library/13/302 and peer-reviewed by Dr. Norman Booth of Oxford University, England.

"A New Fatigue Typology for the Chronic Fatigue Syndrome", co-authored with Fred Friedberg, Maggie McKenzie, and Robert Fontanetta. *Bulletin of the IACFS/ME Association*, 17 (4): 116-142, 2010.

Index to the Bulletin of the Guild of Carillonneurs in North America 1943-2005, co-authored with Margo Halsted of the University of Michigan. Updated version appeared online 2009.

Book Review of Digital Dice: Computational Solutions to Practical Probability Probl*ems,* **Science Books and Films 44 (4): 154, 2008.**

Book Review of *Edge of the Universe: Celebrating Ten Years of* Math Horizons, *Science Books and Films* 43(3): 117, 2007.

Book Review of *Mathematical Connections: A Companion for Teachers and Others*, *Science Books and Films* 42(1): 19, 2006.

Book Review of *Math* from the *Stop Faking It! Finally Understanding Science So You Can Teach It Series*, *Science Books and Films* 42(5): 205-206, 2006.

Book Review of *The Myth of Ability: Nurturing Mathematical Talent in Every Child*, *Science Books and Films,* 41(2): 64-65, 2005.

Book Review of *Abel's Proof*, *Science Books and Films,* 39(6): 256, 2003.

"**T_H1/T_H2 immune response**," *J Allergy Clin Immunol* 110(3): 539-540, 2002

"**Ringing the Changes: An Aural Permutation Group**," pp.137-142 in *Innovations in Teaching Abstract Algebra* (Allen C. Hibbard and Ellen J. Maycock, eds.), MAA, Washington, D.C. 2002.

Book Review of *Multiplication and Division* from Math Success Series, *Science Books and Films*, 38 (1): 309, 2002.

Movie Review of *Measurement and Patterns*, *Science Books and Films,* 37(3): 130, 2001.

"Symptom Patterns in long-duration chronic fatigue syndrome," co-authored with Fred Friedberg, Maggie McKenzie, and Robert Fontanetta. *J Psychosomatic Research* **48**, 59-68, 2000.

Graduate Curriculum Folio Addendum MAT Mathematics Education Program for Senior High School Teaching written for NCATE and Mass. DOE accreditation, 74 pages, FSC Press, March 2000.

Classroom Projects in Discrete Algebraic Structures, edited by myself, projects by my MAT students. FSC Press, Fall 1999.

Graduate Curriculum Folio Mathematics Education Program for Senior High School Teaching written for NCATE and Mass. DOE accreditation, 88 pages, FSC Press, Sept. 1999.

The 10+ Long-term Chronic Fatigue Syndrome Study: A Portrait of Courage, Harrod Lecture Series, Vol. XV, FSC Press, 1997.

Book Review of *Strength in Numbers: Discovering the Joy and Power of Mathematics in Everyday Life*, *Science Books and Films,* **33** (1): 12, 1997

"Coping Reports of Patients with Long-term Chronic Fatigue Syndrome", co-authored with Fred Friedburg, Maggie McKenzie and Robert Fontanetta. *Journal of Chronic Fatigue Syndrome*, **2** (1), 1996.

Index to the Bulletin of the Guild of Carillonneurs in North America, 1940-1993, co-compiled with Margo Halsted, Dept. of Music, University of Michigan. Guild of Carillonneurs in N.A., 1996.

Book Review of *The Story of Mathematics*, *Science Books and Films*, **30** (1): 7, 1994.

"The Chronic Fatigue Syndrome: Influence of Histamine, Hormones and Electrolytes,"
Medical Hypotheses **40**: 55-60, 1993. Reprinted in the *CFIDS Chronicle*, Summer 1993.

Book Review of *The Power of Mathematics*, *Science Books and Films*, **28** (5): 136, 1992.

Book Review of *Fractal Music, Hypercards and More*, *Science Books and Films*, **28** (2): 43, 1992.

"The Socratic Approach To Word Problems," *Primus* **1**(4): 343-6, 1991. (This was an invited article.)

Book Review of *Beginning Technical Mathematics Made Easy*, *Science Books and Films*, **27** (5): 133, 1991.

The Unsuspected Role of Histamine in Chronic Disease- A Mathematician's Discovery, Harrod Lecture Series Vol. VIII, Fitchburg State College Press, 1987.
Adjacent Rings: An Intro for Ordinary Mortals, Harrod Lecture Series Vol. I, Fitchburg State College Press, 1979.

UNPUBLISHED PAPERS/BOOKS:
 "Applications of High School Mathematics- A Bibliography," 1992.

"Chronic Fatigue Syndrome: Roles of Histamine, Hormones and Electrolytes," 1991.

SUPERVISED WORK BY STUDENTS:
Theses (MAT):
A Comparison of the Retention of Mathematical Concepts When Delivered by Two Models of Teaching by Robert E. Michaud. Spring 2004.

The Effect of Homework on the Achievement of Ninth-Grade Mathematics Students in a Suburban, Regional High School by Sean R. McGrath. Spring 2003.

A Study of the Effects of Practice of Multiple-Choice Questions on the Results of MCAS Mathematics Scores by Shawn E. White. Spring, 2003.

Writing to Learn and Conceptual Understanding in Mathematics by Cindy Hammond. Oct. 2001.

Research Presentations by Undergraduates:
"Cryptology" presented by Shawn Case at the Pi Mu Epsilon National Meeting, California State University at San Jose, Aug. 2007.

"The Origins and Roots of Modern Mathematical Terms: An Etymological Survey"
" presented by Mike Adams at the Hudson River Undergraduate Research Conference, April 2005.

"**Cosets and Church Towers**" presented by Ian Pierce. New England Section Mathematical Association of America at Providence College Nov. 2000. Ian won an Outstanding Student Paper Award.

"**Chemical Graph Theory**" presented by Jean Rony Lambert at FSC, Fall 1999.

"**Cauchy Integral Formula and Homotopy**" presented by Chris Watson at FSC, Hudson Valley Undergraduate Research Conference in Mathematics at Siena College, NY in April, 1999 and Massachusetts State College and University Research Conference 1998-1999 in Boston Spring 1999.

"**Error-Correcting Codes"** presented by Carol Webber at FSC Fall 1997, Hudson Valley Mathematics Undergraduate Research Conference at Williams College in April 1998, and New England Section of the Mathematical Association of America Summer Meeting in Vermont June 1998. Carol won an Outstanding Student Paper Award at the MAA meeting.

"**Serendipity in Hamiltonian and Non-Hamiltonian Graphs"** presented by Michelle Tourville Lecuyer at the NE Section MAA Meeting in November 1991 was entirely original work (all theorems and proofs). She won an Outstanding Student Paper Award. She submitted her paper (with my help) for publication in an undergraduate mathematics research journal, but the journal became defunct while it was in press.

"**Eulerian Cycles in Graph Theory**" presented by Michelle Tourville Lecuyer at the NE Section MAA Meeting in Vermont in June 1991. Michelle won an Outstanding Student Paper Award.

"**An Application of Cotrees and Cocycles in Graph Theory**" by George Fusco at the NE Section MAA Meeting in Vermont in June 1991. George won an Outstanding Student Paper Award.

Supervised Independent Study (Grad Students)
Robert Michaud in grad-level Abstract Algebra (Fall 2002).
University of Massachusetts graduate in Galois Theory (Spring 1979).

Supervised Research and Independent Study by Undergraduate Students:
Mike Krul-Applied Abstract Algebra/Cryptology (Spring 2007)
Derek Price-Abstract Algebra II (Fall, 2004).
Ian Pierce- Graduate level Abstract Algebra (Fall, 2000 and Spring 2001)
Rony Lambert -Chemical Graph Theory (Summer, 1999)
Chris Watson- Graduate level Abstract Algebra (Spring, 1999)
Duane Jones-Algebraic Topology (Fall, 1998)
Duane Jones- Graduate level Abstract Algebra (Fall, 1997 and Spring, 1998)
Carol Webber- Error-correcting Codes (Fall, 1997)
Peter Perry- Operations Research/ Graph Theory (Spring, 1997)
Chris Ackler- Operations Research (Spring, 1996)
Bob Hogan and Matt Bolduc -Discrete Algebraic Structures (Spring, 1996)
Matt Bolduc- Fractals (Spring/Summer, 1996)
Michelle Tourville and George Fusco-Graph Theory (Spring, 1991)
About 12 other students from 1979-1991.

SPECIAL SKILLS:
Composer

4 years of carillon lessons including juried national recital for the Guild of Carillonneurs in North America at U of Chicago on June 23, 1977. Granted special *Carillonneur Certificate* equivalent to a diploma from a European Carillon School.

4 years of organ lessons at LMC/SF Conservatory including senior recital on April 27, 1973

Guest Carillonneur at the University of Massachusetts Amherst (2005-2006)

Associate organist/choir director—St. Francis of Assisi Church, Fitchburg, MA (2010-   )

Guest Carillonneur at Norwood Town Hall (1991-   )

Choir Director/ Organist at Faith United Parish, Fitchburg (1993)

Choir Director/Organist at Rollstone Congregational Church, Fitchburg (1987-89)

Associate Organist/choir director- Immaculate Conception Church, Fitchburg (1980-2010)

Accompanist for Shauris Chorale and Orchestra, Fitchburg and Worcester (1985-89)

Guest carillonneur at Northfield-Mt. Hermon School, Northfield, Ma. (1978-1999)

Guest carillonneur at Smith College (1980-83)

Assistant director, organist, and accompanist for FSC Chorus (1978-83)

Music Director St. Anthony's Church, Fitchburg (1979)

PROFESSIONAL ORGANIZATIONS:

Research Honor Societies
Sigma Xi, Scientific Research Honor Society (elected member)
New York Academy of Sciences (elected member)

Research Societies-Mathematics, Medicine, Computer Science
American Mathematical Society (AMS)
Soc. for Industrial and Applied Math (SIAM)
Assoc. for Computing Machinery (ACM)
IEEE Computer Society
International Association for CFS/ME (doctors' research organization)
Association for Women in Mathematics (AWM)

Mathematics Teaching
Mathematical Association of America (MAA) and SIG on Environmental Mathematics
Consortium for Math and Its Applications (COMAP)
National Council of Teachers of Mathematics (NCTM)
Association of Mathematics Teacher Educators (AMTE)

Science--General
Federation of American Scientists
Association for Women in Science
American Association for the Advancement of Science
Sigma Delta Epsilon

Education
National Education Association
Massachusetts Teachers Association
Massachusetts State College Association

General
Alpha Sigma Nu Honor Society
American Association of University Women
Union of Concerned Scientists

Music-Composer and Performance
American Guild of Organists (Boston and Worcester Chapters)
Guild of Carillonneurs in North America
Honorary Member Swiss Guild of Carillonneurs
British and Irish Carillon Society
Inter. Assoc. for Women in Music
Society of Composers

American Music Center
.
COPYRIGHTS:
(Non-carillon works)
(2002) ***Wondrous Love for Choir and Organ***
(1996) ***Centennial March***
(1986) ***Psalm 23 for Chorus, Soloists and Symphony Orchestra****-Mov.1*
(1981) ***Largo for Orchestra***
(1979) ***Suite for Woodwinds and Harp***
(1979) ***Silent Night***
(1976) ***All the Sounds of the Earth***
(1976) ***Meditations on Freedom***
(1973) ***Suite of Moods for organ***

(Carillon works)
Too numerous to list

CARILLON RECITALS:
2011 Wellesley College, Wellesley, MA—80th anniversary of the carillon and summer series
2010 Norwood Town Hall, Norwood, MA; Middlebury College, Middlebury, VT

2009 First Presbyterian Church, Stamford, CT.

2008 Middlebury College, Middlebury VT; Norwood Town Hall, Norwood, MA., Wellesley College, Wellesley
    MA.

2007 University of California Riverside; Trinity College, Hartford CT.

2006 Our Lady of Good Voyage, Gloucester MA; Norwood Town Hall, Norwood, MA.

2005 University of Massachusetts, Amherst; Norwood Town Hall, Norwood, MA.

2004 Norwood Town Hall, Norwood, MA.; Wellesley College, Wellesley, MA.

2003 Luray Caverns, Luray, VA

2002 Old Bond St., London, **England**; Newcastle Civic Center, Newcastle-Upon-Tyne, **England**; War Memorial
Carillon, Loughborough, **England**; Foreign Language School Commencement, Middlebury College, VT; City Hall, Albany, NY; Norwood Town Hall, Norwood, MA.

2001 Wellesley College, Wellesley, MA; University of Wisconsin Madison; Norwood Town Hall, Norwood, MA.

2000 Crystal Cathedral, Garden Grove, Ca.; University of California at Riverside; The Millennium Carillon, Naperville, Illinois.

1999 Norwich University (Commencement), Norwood Town Hall, Norwood, Ma., Our Lady of Good Voyage Church, Gloucester, Ma.

1998 Mayo Clinic, Rochester, MN; 1st Presbyterian Church, Stamford, Conn.; St. James Episcopal Church, Danbury, Conn.; Univ. of Connecticut at Storrs; Norwood Town Hall.

1997 Norwich University; 1st Presbyterian Church, Stamford, Conn.; 1st Congregational Church, E. Hartford; Norwood Town Hall.

1996 Middlebury College; 1st Presbyterian Church, Stamford, Conn. Norwich University (Commencement); Simsbury Methodist Church, Simsbury, Conn.; Norwood Town Hall.

1995 1st Presbyterian Church, Stamford. Conn.; St. James Episcopal, Danbury, Conn.; Yale University; Middlebury College; Norwich University; Norwood Town Hall.

1994 Saltley R.C. Church, Saltley, **England**; St. Johns Kirk, Perth, **Scotland**; Holy Trinity Kirk, St. Andrews, **Scotland**; St. Marnocks' Kirk, Kilmarnock, **Scotland**; St. Patrick's Kirk, Dumbarton, **Scotland**; St. Patrick's Cathedral, Armagh, **No. Ireland**; St. Colman's Cathedral, Cobh, **Ireland**; Bournville School, Bournville, **England**; Loughborough War Memorial, Loughborough, **England**; St. Nicholas Kirk, Aberdeen, **Scotland**; Tiergarten, **Berlin**, **Germany**; Our Lady's Kirche, **Copenhagen**, **Denmark**; Danish Carillon School, Logumkløster, **Denmark**; Kassel Kirche, Kassel, **Germany**; Markt Kirche, Wiesbaden, **Germany**; Hasselt Church, Hasselt, **Belgium**; University of Louvain, **Leuven**, **Belgium**; Bond St. Carillon, **London**, **England**; Norwood Town Hall, Mass.
1993 Northfield- Mt. Hermon School, Northfield, Ma.; Smith College; St. Mark's Episcopal, New Canaan, Conn.; St. James Episcopal, Danbury, Conn.; Univ. of Connecticut, Storrs; 1st Presbyterian Church, Stamford, Conn.; Our Lady of Good Voyage, Gloucester, Ma.; Middlebury College; St. Stephen's Episcopal, Cohasset, Ma.; Town Hall; Norwich University.

1992 1st Presbyterian, Stamford; Norwood Town Hall; Northfield-Mt. Hermon School; Norwich Univ.

1991 Norwood Town Hall; Northfield- Mt. Hermon School; St. James Episcopal, Danbury; Wellesley College; Norwich University; 1st Presbyterian Church, Stamford.

1990 Norwood Town Hall; St. James Episcopal, Danbury; St. Stephen's Church, Cohasset; Northfield-Mt. Hermon School; Norwich University.

1989 Norwood Town Hall; Nederlands Peace Carillon, Victoria, **British Columbia**.

1988 Univ. of California, Santa Barbara (Commencement); Univ. of California, Riverside; Our Lady of Good Voyage, Gloucester; 1st Presbyterian Church, Stamford; Northfield-Mt. Hermon School

1987 Professional recording of carillon recital at Northfield-Mt. Hermon School; St. Mark's Episcopal, New Canaan; Norwood Town Hall.

1986 Norwood Town Hall; Our Lady of Good Voyage, Gloucester; Northfield-Mt. Hermon School; Riverside Church NYC; **International Congress of Mathematicians** at UC Berkeley; 1st Presbyterian, Stamford.

1985 Our Lady of Good Voyage, Gloucester; Norwood Town Hall.

1982 St. Stephen's, Cohasset; Phillips Academy, Andover; **American Mathematical Society Summer Meeting** at University of **Toronto, Canada**; **Canadian National Exhibition**; Metropolitan Church, **Toronto**

1981 Smith College; Yale University; St. Stephen's; Phillips Academy; University of California, Riverside

1980 University of California, Berkeley

1979 University of California, Riverside

1978 University of California, Riverside (Commencement)

HONORS:

Chosen to give an hour invited address to the Northeastern Section of the Mathematical Association of America. Fall, 2003.

Chosen by the Worcester Chapter, American Guild of Organists to be part of a members' recital, St. Cecilia's Church, Leominster, MA on Feb. 9, 2003.

Chosen for radio interview on the Al Verona show, radio WICN Worcester. Sept. 2002. Topic was the Chronic Fatigue Syndrome.

Premiere of *"Wondrous Love" for Choir and Organ* by Immaculate Conception Choir, March 29, 2002 in Immaculate Conception Church, Fitchburg, MA.

Chosen as one of nine female mathematicians to represent the U.S. on a People-to-People delegation to Russia in May 1998. The delegation met with female research mathematicians and professors in Moscow and St. Petersburg.

Commissioned to write **Centennial March** for the 100th Commencement of Fitchburg State College. Premiered at Commencement, May 27, 1996. Played at all FSC Commencements since then.

Chosen by the Worcester Chapter, American Guild of Organists, to give the Fitchburg component of the "World's Largest Organ Recital" commemorating the centennial of the AGO, April 14, 1996.

Chosen to be on the *program committee* for the June Meeting, 1996 of the Northeastern Section of the Mathematical Association of America.

Made **Honorary Member**, Swiss Guild of Carillonneurs, 1994.

International Woman of the Year Award 1992-93, from the International Biographical Centre, Cambridge, England.

Performance of carillon arrangements of mine at the Crystal Cathedral, Garden Grove, Ca. at the televised Christmas Eve service (1991) and at services regularly from 1992 on until the carillonneur died in 2004.

Distinguished Service Award at Fitchburg State College (1988)

Only U.S. scientist and one of three Massachusetts residents chosen to be on the People-to-People Citizen Ambassador Women in Management delegation to the People's Republic of China in August, 1987. Invited again in 1988 and 1989. (The 1989 delegation was cancelled due to the Tiannamen Square Massacre.) Only Massachusetts resident chosen to go on the USSR delegation in 1990 and 1998.

Chosen to give Walter Harrod Research Lectures at FSC in 1996, 1987 & 1979

Performance of carillon arrangements of mine at the Riverside Church in NYC for Christmas Eve service (1980-89)

One of five mathematicians whose detailed biographies appear in **The Myths and Ms. of Math** by Joyce Mansfield, l983.

Premiere performances of *Largo for Orchestra* by Shauris Chorale and Orchestra in Fitchburg and Worcester, Ma. (1981)

Premiere performance of *Suite for Woodwinds and Harp* at Thayer Conservatory, Lancaster, Ma. (1981)

Broadcast of the above piece, Radio WICN Worcester, Ma. (1981)

Distinguished Service Award at Fitchburg State (1981)

Elected to the New York Academy of Sciences (1979)

Elected a full member of Sigma Xi, the Scientific Honor Society (1979)

Biography has been in:
  American Men and Women of Science
  The World's Who's Who of Women
  Who's Who of American Women
  Who's Who in Science and Engineering
  Who's Who in American Education
  International Who's Who of Business and Professional Women

COMMUNITY ACTIVITIES
Liaison with the Society of Actuaries (1987-2007)

On the Board for the Special Interest Group in Environmental Mathematics of the MAA (2002-2004).

Director-at-Large, Massachusetts CFIDS Assoc. (1997-), Vice President, Massachusetts CFIDS/ME Association (2008-   ), Website Committee Chair , Massachusetts CFIDS/ME Association (oversaw the total revamping of the website and wrote a lot of the material: http://www.masscfids.org) (2003-), Treasurer, Massachusetts CFIDS Association (1997-2003), Medical editor, the Mass. CFIDS Assoc. *Update* (1997-2003). Elected to the Medical Issues Committee (1992-2003)

Helped run the American Association for Chronic Fatigue Syndrome Research International Biannual Conference Boston Oct 1998 and proofread all medical abstracts for the 100-page program book.

Member of organizing committee for the Guild of Carillonneurs in North America 1996 National Congress at St. Stephen's, Cohasset.

Volunteer scientist for Boston Museum of Science Science-by-Mail for grades 4-8 (1996-2000)

Featured speaker for the January, 1995 meeting of the Fitchburg Business and Professional Women's Club on *The Long-term 10+ CFIDS Study*
Co-Chair of Fitchburg Business and Professional Women's Club Young Careerist Competition, February, 1994

Speaker for the COMETS of Faith United Parish, Fitchburg on *Women in China*, 1993

Featured speaker for the January, 1992 meeting of the Fitchburg BPW. Talk on *Women in China*.

Coordinator for the Northeast and Canada for the Women in Mathematics Program of the Mathematical Assoc. of America. (1980-89)

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ghigdon@fitchburgstate.edu

EDUCATION

Lehigh University, Bethlehem, Pennsylvania Major: Mathematics	PhD.	1975
Northeastern University, Boston, Massachusetts Concentrations: Economics and Finance	M.B.A.	1982
University of Kentucky, Lexington, Kentucky Major: Mathematics	M.A.	1968
Villa Madonna College, Covington, Kentucky Major: Mathematics	B.A.	1966

PROFESSIONAL EMPLOYMENT

Acting Chair of the Department of Mathematics	Fall 2002
Chair of the Department of Mathematics	1992 - 2001
Associate Professor of Mathematics (tenured)	
Fitchburg State University, Fitchburg, Massachusetts	1981 - present
Assistant Professor of Mathematics	
Fitchburg State University, Fitchburg, Massachusetts	1977 - 1981
Lafayette College, Easton, Pennsylvania	1975 - 1977
Instructor of Mathematics	
Lafayette College, Easton, Pennsylvania	1970 - 1975

SELECTED COURSES TAUGHT

Graduate: Probability Theory, Real Analysis, Complex Analysis, Number Theory, Discrete Mathematics, Quantitative Methods (Business Department)

Advanced Undergraduate: Operations Research, Complex Analysis, Real Analysis, Probability and Statistics, Advanced Multivariate Calculus, Differential Equations, Numerical Analysis, Discrete Mathematics, Linear Algebra, Introduction to Mathematical Thought, Mathematics Seminar

Undergraduate Service Courses: Probability and Statistics, Elementary Functions, Calculus, Business Calculus, Precalculus, Finite Mathematics

COLLEGE COMMITTEES AND RESPONSIBILITIES (Fitchburg State College)

Mathematics Coordinator for Graduate & Continuing Education   1984 - 2002
        Duties include review and recommendations for
        mathematics courses and instructors in
        Graduate and Continuing Education, consultation, and

advice on all matters related to mathematics.

Elizabeth M. Haskins Mathematics Contest, Chairman   1982 – present
   Duties include the preparation of the contest
   examination and the coordination of the related
   activities of the day. The contest is for regional
   high school students and averages 500 participants.

Mathematics Department
   Graduate Committee (Chair)   2001 – 2002, 1978 – 1981
   Duties included the selection and scheduling of
   courses, academic and professional advising,
   monitoring the progress of students, and
   administration of all comprehensive examinations.
   Graduate Committee (Member)   1998 – 2001
   Chairperson Evaluation Committee   1981 - 1984
   Hiring Committee   1979 - present

   Departmental Evaluation Committee   2001 - 2002
              1982 - 1983
   Curriculum Committee   1992 – present
              1977 – 1979
   Coordinator of Mathematics Readiness Program 1994 - 2010
   and Basic Mathematics Courses

College Committees
   Chair of Chairs   1999 – 2001
   All College Committee (Chair)   2009 – 2010
              2006 – 2007
              2005 – 2006
              2004 – 2005
              2003 – 2004
   All College Committee (Member)   2010 - 2011
              Fall 2010
              2008 – 2009
              2007 – 2008
              Fall 2002
              1995 – 1998
   Strategic Planning Council   2002 – 2003, 2003 – 2004
   Mathematics Science Task Force   1999 - 2001
   Academic Waiver Review Committee   1992 - 1994
   Academic Policies Committee   (Chairman) 1995 - 1996
   Academic Policies Committee (Member) 1982 - 1983
              1980 - 1981
   Computer Advisory Committee   1992 - 1994
   Committee for the visit of the New England 1985
   Association of Schools and Colleges on Graduate
   and Continuing Education
   NEASC Mission Committee   2001

   Management Program Review Committee 1987
   Duties included a complete review of the graduate
   management program with particular attention to
   the curriculum and the credentials and quality of
   the faculty who teach in the program and to develop
   recommendations for change and improvement.

Search Committees
  Exercise and Sport Science   2004 – 2005
  Associate Dean of Students   1979
  Assistant to the Vice President for Student   1983
  Services

<u>PROFESSIONAL ACTIVITIES</u>

American Diploma Project
    Representative of the MSCA at the Boston Meetings 2002
    sponsored by the Board of Higher Education and
    the Department of Education
    Gap Analysis Faculty Panel Member, Worcester   2002

Massachusetts Board of Higher Education
    Assessment Advisory Group   1997 - 1999
    Mathematics Assessment Task Force (Chair)   1997 - 1998

Selected Presentations
    "Rectangular to Polar Transformations"
    National Joint Meetings of the American Mathematical   2011
    Society and the Mathematical Association of America,
    New Orleans, Louisiana

    "The Blip of the Blop: A Successful Mathematics
    Major Seminar"
    National Joint Meetings of the American Mathematical   2010
    Society and the Mathematical Association of America,
    San Francisco, California

    "Some Generalized Circle Methods are Fourier Effective"
    Kent State Summability Mini-Conference   2008
    Kent, Ohio

    "Bell Summability"
    National Joint Meetings of the American Mathematical   2003
    Society and the Mathematical Association of America,
    Baltimore, Maryland

    "Sometimes the Only Continuous Functions are
    Constant Functions"
    Invited address at Rhode Island College   2002
    Fitchburg State College Colloquium   2001

    "Continuity and Convergence"
    Regional Joint Meeting of the Seaway and   2002
    Northeast Section of the Mathematical Association
    of America, Williamstown, Massachusetts

    "The Most Beautiful Equation in the World"
    Fitchburg State College Elizabeth Haskins   2001
    Mathematics Contest

    "Geometry and Probability"
    Invited address, Rhode Island College   1988

"Competencies for Entry-Level College
Mathematics Courses and a Testing
System for Assessing Them"
Panelist at the Conference on Mathematics and   1998
Quantative Thinking, University of
Massachusetts, Boston

Personnel Evaluation Committees (outside Department of Mathematics)
    Peer Evaluation Committee   2005 – 2006, 2003 – 2004
      Department of Exercise and Sport Science
    Chair Evaluation Committee (Chair)   2005 – 2006
      Department of Exercise and Sport Science
    Tenure Committee   2001 – 2002
      Department of Computer Science

Research/Publication Activities
    "The Blip of the Blop Equals (?) The Blop of the Blip
    An Undergraduate Mathematics Major Seminar"
    Submitted to PRIMUS, March, 2011.

    Director of honors thesis "A Generalization of the Taylor Matrix"
    by Melanie E.C. Gasbarro 1994 – 1995

    Papers in Preparation
    "A Method of Summability Based on the Bell Numbers"
    "Fourier Effectiveness of Some Generalized Circle Methods"

Comprehensive Examination
    Prepared and evaluated master's comprehensive examinations in analysis, probability,
    complex analysis, and number theory (1978 – 1980, 2000, 2002).

Continuing Education
    Attended a weeklong conference at Dartmouth College on computers and the teaching
    of mathematics as one of 30 selected participants in a Sloan Foundation program.

    Acquired advanced degree (M.B.A.) in related discipline by completing program of 28
    quarter courses in three years.

    Attended A.M.S. short courses in Operations Research (1975), Statistics (1977), and
    Game Theory(1979).

    Participated in faculty seminars in extension groups and piecewise linear topology (1978).

    Gave weekly lectures in summability for one semester to the mathematics faculty
    Seminar (1979).

Consultations
    Worked with the Fitchburg Gas and Electric Company (1978) on a matter internal to the company and
    with Raytheon Corporation (1978) on a joint project with Fitchburg State College. Additional work
    included assistance in the preparation of a doctoral dissertation in mathematics (1976).

Miscellaneous
    Several talks and panel discussions at local high schools and at Fitchburg State College.

    Regular and frequent attendance at A.M.S. and M.A.A. national and regional meetings.

Director of many independent study projects for junior and senior mathematics majors.

AWARDS

Vincent J. Mara Award for Excellence in College Teaching	2005
Nominee	1991, 2003, 2004
Sloan Foundation Award (see professional activities)	1992
Fitchburg State College Professional Development Grant	1980, 1982

PROFESSIONAL ORGANIZATIONS

American Mathematical Society

Mathematical Association of America

COMMUNITY ORGANIZATIONS

Board of Directors – Julie Country Day School	1999 – 2002

PERSONAL INFORMATION

Birth Date:	March 17, 1944
Martial Status:	Married
Hobbies	Tennis, running, bridge

REFERENCES

Available on request

COMPREHENSIVE RESUME
(Fall 2011)

Personal Data

Name:	Claire C. McAndrew
Address:	49 State Road East
	Westminster, MA 01473
Phone:	(978) 665-3072 (Office) (978) 874-5414 (Home)
E-mail:	cmcandrew@fitchburgstate.edu
Birth Date:	July 1, 1944

Work Experience

1983-Present	Fitchburg State University; Fitchburg, MA
	Department of Mathematics

2008-Present	Professor of Mathematics
Spring 2010	Interim Chair -- Mathematics
2002-2009	Chairperson -- Mathematics Department
1989-2008	Associate Professor of Mathematics
1983-1989	Assistant Professor of Mathematics

At Fitchburg State University I teach many of the usual courses in an undergraduate mathematics curricula, serve as advisor to undergraduate students, and serve on departmental and college-wide committees. Since Summer 2002, I have also taken on the many responsibilities of the Chairperson of the Mathematics Department. These involve primarily providing leadership for Department and College initiatives, coordinating all department schedules and activities, representing the department in various capacities both within the college community and to the larger community, acting as liaison between department faculty and the college administration, fulfilling all other responsibilities as outlined in the MSCA Agreement, and being the prime contact for both faculty and student initiatives, inquiries, and complaints.

1968-1979	Marywood College (now Marywood University0; Scranton, PA
	Department of Mathematics
1971-1979	Assistant Professor of Mathematics
1971-1972	Acting Chairperson of the Mathematics Department
1968-1971	Instructor of Mathematics

At Marywood, I taught the usual courses in an undergraduate mathematics curricula and several courses in the Graduate Division for business students and mathematics' education students. I also served on many departmental and college-wide committees.

1967-1968	Georgetown University; Washington, D.C.
	University Fellow, Department of Mathematics
	National Science Foundation Pre-doctoral Traineeship

I taught freshman level mathematics courses at Georgetown with full responsibility for lectures, tests, homework, and grading.

Educational Background

1979 Ed.D.   Lehigh University, Bethlehem, PA.
                  Division of Educational Research and Measurement, School of Education
                  Dissertation Topic:

                  "A Comparison of Prediction Models Used for Predicting College Grade Point Average"

1968 M.A.   Georgetown University; Mathematics

1966 B.A.   Marywood College; Mathematics and Secondary Education.
                  Graduated Magna Cum Laude

Summer Institutes:
1970 and 1971   National Science Foundation Summer Courses
                  (in Linear Algebra and Statistics)

                  San Jose State University, San Jose, CA.

1969   Workshop on Computer Assisted Instruction (CAI)
                  North Carolina State University,   Raleigh, N.C.

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Courses Taught at Fitchburg State University – 1983 to 2011

Math 0200   Basic Math II
Math 1000   Nature of Mathematics
Math 1200   Finite Math
Math 1250   Introduction to Functions
Math 1300   Precalculus
Math 1700   Applied Statistics
Math 2200   Business Calculus
Math 2600   Linear Algebra
Math 2800   Business Statistics
Math 2300   Calculus I
Math 2400   Calculus II
Math 3300   Calculus III
Math 3400   Calculus IV
Math 4200   Probability and Statistics I
Math 4250   Probability and Statistics II
Math 4975   Directed Study
Math 4900   Independent Study

- Mathematical Association of America (MAA)*.   (FSU Liaison to the MAA*; 30+ year member)
- MAA/NES (MAA Northeast Section 25+ year member) *
- SIGMAA[STAT], MAA Special Interest Group – Statistics*
- Pi Mu Epsilon, Mathematics Honor Society*
- American Statistical Association (ASA).
- American Mathematical Society (AMS)
- Association of Women in Mathematics (AWM).
- Montachusett Mathematics Educators' Alliance (M^2E)
  (I served for the years 1992-1996 as a member of the Steering Committee to this school/college partnership promoting more effective mathematics education at all grade levels. The organization is no longer active.)

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Professional Conferences/Meetings Attended

Academic Years 2008 – 2011
1. STEM Conference in Sturbridge, MA October 2010.
2. NES/MAA Spring Meeting at Salve Regina University, Newport, R.I. – June 10-11, 2009.
3. BHE-sponsored Student Transfer Workshop – University of Massachusetts, Amherst, October 24, 2008.
4. NES/MAA Dinner Meeting at Simmons College, Boston, MA – October 27, 2008.
5. AMS/MAA Joint Meetings in Washington, D.C., January 4 – 7, 2009.
   (I attended the Data Mining and New Trends in Teaching Statistics mini-course – Jan.2-3, 2009.)

Academic Year 2007 – 2008
1. Meeting of MA State College Mathematics Department Chairs –Worcester State College, August 28, 2007. (Purpose: Strengthen the mathematics preparation of students in approved state licensure programs for elementary or middle school teachers.)
   (I gave an invited talk at this meeting.)
2. Meeting of Central MA Public College Mathematics Department Chairs -- Worcester State College, January 11, 2008. (Purpose: To make transfer of mathematics courses between the four central MA public higher education institutions (FSC, WSC, MWCC, QCC) more transparent and to align expectations of the institutions' mathematics readiness requirements.
3. Meeting with MA Department of Education on the new recommendation for the mathematics preparation of students in approved teacher education programs in the state's public higher education institutions and the new mathematics subtest of the MTEL – Framingham State College, April 3, 2008.
3. Edutron/Fitchburg Public Schools joint workshop for middle school mathematics teachers. Conducted by Dr. Andrew Chen of Edutron, with whom the FSC Mathematics Department had partnered for DOE-sponsored mathematics teacher preparation workshops, and Ms. Lucy West, a nationally known 'mathematics coach'.   Fitchburg Memorial Middle School, June 2008.   (I participated for two days of this 5 day workshop.)
4. Massachusetts DOE-sponsored conference "Sustaining Growth, a Conference on Student Success" on the preparation of high school graduates and their preparedness readiness for a college or career path. Bridgewater State College, June 18, 2008.

Academic Year 2006 – 2007
1. STEM III Conference, (State sponsored conference aimed at promoting Science, Technology, Engineering, and Mathematics education and careers.) – Sturbridge, MA – October 25, 2006.

2. ICTCM Conference (International Conference on Technology in Collegiate Mathematics) –
    Boston, MA, February 16/17/18, 2007.
3. I^3 Conference for Teachers of Mathematics, Leominster, MA.
    Sponsored by Edutron and area school systems –   March 15, 2007.
    (As Mathematics Department Chair, I was listed on this program as a 'sponsor'.)
4. Meeting of MA State College Mathematics Department Chairs –Worcester State College, March 30,
    2007. (Purpose: Strengthen the mathematics preparation of students in approved state licensure
    programs for elementary or middle school teachers.)
5. Cryptology and Coding Workshop, NSF-sponsored workshop
    Olin College of Engineering, June 6, 2007.
6. MAA/NES Spring meeting – Keene State College, Keene, NH, June 8/9, 2007.
7. On-line Course Development and Blackboard Workshop (given by M. Leamy, FSC coordinator of on-
    line course development) – Spring 2007

Academic Year 2005 – 2006
1. MAA Northeast Section Fall meeting,
    University of New Hampshire – Nov. 18/19, 2005
2. I^3 Conference for Teachers of Mathematics, Leominster, MA.
    Sponsored by Edutron and area school systems –   March 15, 2006.
3. HRURC – Hudson River Undergraduate Research Conference,
    Westfield State College, Westfield, MA.— April 8, 2006.
    (Two of our students made presentations at this conference.)
4. NEEAN Conference on Outcomes Assessment (Discipline Specific Workforce)
    University of Massachusetts, Amherst, -- April 21, 2006
5. MAA Northeast Section Spring meeting
    Boston University, Boston, MA – June 2/3, 2006.
    (One of our students made a presentation at this conference.)

Academic Year 2004 – 2005
1. MathFest, MAA Summer Meetings
    Providence, RI – August 11-14, 2004
2. MAA Northeast Section Fall meeting,
    Worcester Polytechnic Institute – Nov. 19/20, 2004.
3. I^3 Conference for Teacher of Mathematics, Leominster, MA.
    Sponsored by Edutron and area school systems – March 23, 2005.
    (One of our students had a poster session at this conference.)
4. HRURC – Hudson River Undergraduate Research Conference,
    Williams College, Williamstown, MA. April 29/30, 2005.
    (One of our students made a presentation at this conference.)
5. Participated in FSC IT workshops.

Academic Year 2003 – 2004
1. MAA Northeast Section Fall meeting
    Wellesley College, November 21-22, 2003.
2. MAA Northeast Section Spring meeting
    Roger Williams College, Bristol, RI, June 3-4, 2004.
3. Participated in FSC IT workshops.

Academic Year 2002 – 2003
1. MathFest, MAA Summer Meetings
    University of Vermont, Burlington, VT. August 1 – 3, 2002
2. Addison Wesley Math Workshop (Statistics)
    Community College of Rhode Island, Warwick, RI. October 5, 2002
3. ICTCM (International Conference on Technology in Collegiate Mathematics)
    Orlando, FL. Oct. 31 – Nov. 3, 2002

Academic Year 2001 – 2002
1. MAA Northeastern Section Summer Meeting
    Williams College, Williamstown, MA. June 21 – 22, 2002

2. MAA Summer Workshop "Integrating the Web into Mathematics Instruction"
   Plymouth State College, Plymouth, NH. June 23 – 27, 2002

Academic Year 2000 – 2001
1. ICTCM (International Conference on Technology in Collegiate Mathematics)
   Atlanta, GA. November 15-17, 2000
2. MAA Northeastern Section Summer Meeting
   Norwich University, Northfield, VT – June 8 – 9, 2001

Academic Year 1999 – 2000
1. MAA Northeastern Section Spring Meeting,
   Holy Cross College, Worcester, MA.   Spring, 2000
2. NSF Sponsored "Mathematical Connections" Workshop
   (Renewing Business Calculus)
   Villanova University, Villanova, PA – June 2000
3. Workshop at Fitchburg State College
   Computer home-page dedicated to course info

Academic Year 1998 – 1999
1. Hudson River Undergraduate Research Conference
   Sienna College, Loudenville, NY – Spring, 1999

Academic Year 1997 – 1998
1. Hudson River Undergraduate Research Conference
   Union College, Schenectady, NY, April 18, 1998
   (One FSC student made a presentation at this conference.)
2. Workshop on Technology in Statistics Education
   Babson College, Newton, MA, March 28, 1998
3. Focus on Technology Conference – FSC Workshops
4. Faculty professional development workshops at FSC – May 26/27. 1998

Academic Year 1996 – 1997
1. MAA Northeastern Section Spring Meeting,
    UMass, Boston, MA – April, 1997.
2. FSC Academic Computing Center Workshops
    Spring and Summer 1997

Academic Year 1995 – 1996
1. M^{2}E Alliance - Steering Committee for Panel Presentations
   Memorial Middle School, Fitchburg – November, 1995.
2. Calculus Reform Workshop – Calculus in a Real and Complex World,
   Pennsylvania State University, University Park, PA – July/August 1996 (five day program).

Academic Year 1994 – 1995
1. MAA Northeastern Section Spring Meeting
   Holy Cross College, Worcester, MA – April, 1995.
2. Calculus Reform Workshop - MAA Sponsored
   University of Maine, Orono, ME – June, 1995 (five day program).
3. M^{2}E Alliance Steering Committee

Academic Year 1993 – 1994
1. ICTCM (International Conference on Technology in Collegiate Mathematics)
    Parsippany, NJ – November 4-7, 1993.
2. MAA Minicourse - Teaching the Introductory Statistics Course
   Holy Cross College, Worcester, MA. April 9, 1994.

Academic Year 1992 – 1993
1. MAA Northeastern Section Dinner Meeting – Westminster Village Inn – March 30, 1993
    (I assisted in organizing this meeting at which Drs. Cosgrove and Dechene gave a joing
     presentation.)

Academic Year 1991 – 1992
1. NSF Sponsored DERIVE Workshop on Calculus Reform
   University of Hartford – July 7 – 9, 1992 (a three day program)

(NOTE: Based largely on work from this workshop, I initiated the first calculus computer labs for FSC Calculus II courses in AY 1992 – 1993. Dr. R. Bisk did likewise for the Calculus I sections.))

    2. Calculus Reform in Connecticut, an NSF Conference
       University of Hartford – July 10, 1992

Academic Year 1990 – 1991
    1. Bentley College Computer Workshop – February 8, 1991

Academic Year 1989 – 1990
    1. MAA Northeastern Section Fall Meeting
       Holy Cross College – November 17-18, 1989

Academic Year 1988 – 1989
    1. American Mathematical Society 100th Year Anniversary Summer Meeting
       100 Years of American Mathematics – August 8 – 12, 1988
    2. MAA Northeastern Fall Meeting
       Rhode Island College, Providence, RI – November 18-19, 1988
    3. Point 5 Workshop at FSC – January 1989
    4. Spring Conference on the First Two Years: *Teaching the Mathematical Core*
       University of Hartford – March 31/April 1, 1989

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Professional Development Workshops / Mini Courses Attended

- Data Mining and New Trends in Teaching Statistics -- at AMS/MAA Joint Meetings, Washington, D.C., January 2009
- Cryptology and Coding Workshop – at Olin College of Engineering, Needham, MA, sponsored by the NSF, June 2007
- Workshop on the power of Maple 10 to enhance upper level college mathematics courses – at ICTCM Conference in Boston, February 2007
- Addison Wesley Statistics Workshop – at the Community College of Rhode Island, Warwick, R.I., October 2002
- Workshop on "Integrating the Web into Mathematics Instruction" – at Plymouth State College, Plymouth, N.H., sponsored by the MAA, June 2002
- Workshop on "Mathematical Connections" (on renewing the Business Calculus course) – at Villanova University in PA, sponsored by the NSF, June 2000
- Workshop on "Technology in Statistics Education" – at Babson College, Newton, MA, March 1998
- Calculus Reform Workshop "Calculus in a Real and Complex World – at Pennsylvania State University, University Park, PA, sponsored by the NSF, Summer 1998
- Calculus Reform Workshop – at University of Maine at Orono, ME, sponsored by the MAA, June 1995
- MAA Mini-course "Teaching the Introductory Statistics Course" – at Holy Cross College, Worcester, MA, April 1994
- "DERIVE Workshop on Calculus Reform – at University of Hartford, Hartford, CT, sponsored by the NSF, July 1992. (Based on this workshop I began the FSU technology labs for Calculus II for the Spring 1993 semester.)
- Bentley College Computer Workshop – at Bentley College, February 1991

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Published / Unpublished Works

1. ***History of the Mathematics Readiness Program at Fitchburg State College – 2008***
   Prepared for an outside review of the FSU Mathematics Readiness Program requested by the Vice President of Academic Affairs and conducted in the spring semester of 2008. Co-authored with Dr. Lucy Dechene.

2. ***Mathematics Department Self Study Report for the Program Review -- 2006***
   Primary author, editor, and project manager, and department coordinator.
3. ***Basic Math II Distance Learning Course – Math 0200 – Fitchburg State College -- 1998***

Project manager, co-author, editor and interface with GCE and on-line provider for the development of this course.

Note:
For the latter two of these publications, I was chief designer and manager, chief editor and trouble shooter, and served as liaison with Academic Affairs and/or GCE and the college's on-line service provider.   I also served as co-author together with other Mathematics Department faculty. Also for both of these projects, the project managing took an enormous amount of planning and coordination that extended into multiple semesters of work and coordination with department faculty and with entities outside the Mathematics Department.

4. **Statistics Computer Labs/Simulations Using MINITAB or EXCEL**
   - Introduction: Why Excel?
   - Minitab 14 – An Introduction
   - 10 detailed labs for use in Math 1700 – these include data summary, graphical summaries, inference procedures, regressions studies, simulations for 'the birthday problem', the 'central limit theorem' and other concepts such as '95% confidence intervals'.

5. **Calculus I Computer Labs using DERIVE**
   - Introduction and Overview of DERIVE for Windows.
   - 11 detailed labs including both software instructions and concept development or experimentation. Topics include limits, tangent lines, derivatives – the concept and various computational methods, extreme values, 1st and 2nd derivative tests for extreme values, the mean value theorem and other applications of differentiation with graphical examples where applicable.

6. **Calculus II Computer Labs using DERIVE**
   - Introduction and Overview of DERIVE for Windows.
   - 8 detailed labs including both software instructions and concept development for topics in Math 2400, Calculus II. Topics include areas and Riemann sums and their use in defining the definite integra of a function, the fundamental theorem of calculus, numerical integration, inverse functions and their derivatives, the natural log function and its inverse.

Presentations:
1. *Using Minitab 14.* This was **an invited presentation/workshop** given at the request of the FSC IT office when Minitab was chosen as the principal statistics software for the entire campus, given at Fitchburg State August 30, 2010.

2. *Mathematics Department Assessment Plan – Getting Started.* Talk given at the annual FSU Assessment Day program. May 2009.

3. *Summary of FSC Planning to Revise the Mathematics Program for Education Majors*
   An invited talk given to MA State College Mathematics Chairs / Representative at Worcester State College – August 28, 2007

4. *Using MINITAB for Statistical Calculations and Simulations*
   Computer faculty workshop sponsored by the Mathematics Department – May 1994.

5. *Using the TI-85 Calculator for Statistical Calculations and Graphs*
   Computer faculty workshop sponsored by the Mathematics Department – May 1994.

6. *Using DERIVE in the Calculus I and Calculus II courses*
   Computer faculty workshop sponsored by the Mathematics Department – May 1993.

7. *Comparing Admissions Standards at Selected Colleges throughout Massachusetts and the Northeast*
   Given at an FSC faculty-sponsored Seminar on Improving Admissions Standards at the College— May 1993.

8. *Counting: It's Elementary* . A talk given at the "Diversity on Common Ground" conference, sponsored by Fitchburg area school districts as a professional development program at Mount Wachusett Community College– March 1990.

9. *An Introduction to the Study of Mathematics and to the Mathematics Faculty at Fitchburg State College* Given at Admissions' Open House Programs for new students in several Fall semesters.

Textbook Reviews:

1. Two reviews / evaluations for W. H. Freeman & Co. of the text *Statistics: a Problem Solving Approach* by Stephen Kokosa, one in Spring 2006 and the second in Fall 2006.

2. Two stage in depth review for Saunders College Publishing of the text *Finite Mathematics, 2nd edition,* by Zitterelli and Coughlin in AY 1990—1991.
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DR. BRUCE ROMANO

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Department of Mathematics
Fitchburg State University
160 Pearl St.
Fitchburg, MA 01420

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bromano1@fitchburgstate.edu

CURRENT POSITION   ASSISTANT PROFESSOR OF MATHEMATICS
Fitchburg State University

EDUCATION   BRANDEIS UNIVERSITY
Waltham, MA
2006 Ph.D. in Mathematics
Dissertation Title: "On Stark's Conjecture for Octahedral
Representations and a Related Rubin-Stark Conjecture."
Advisor: Dr. Fred Diamond
Major concentration in Number Theory
Minor concentration in Combinatorics

BRANDEIS UNIVERSITY
Waltham, MA
2004 Master of Arts in Mathematics

UNIVERSITY OF MASSACHUSETTS
Boston, MA
1997 Bachelor of Arts in Mathematics
Magna Cum Laude

EXPERIENCE   ASSISTANT PROFESSOR OF MATHEMATICS
Fitchburg State University; Fitchburg, MA   2009-Present
**Teaching Business Calculus, Pre-Calculus, Applied Statistics, Business Statistics,
Calculus I, Calculus II, Linear Algebra.**

INSTRUCTOR
Tufts University; Medford, MA   2008-2009
Teaching Calculus I, II, and III.

ASSISTANT PROFESSOR OF MATHEMATICS
Pine Manor College; Chestnut Hill, MA   2005-2008
Teaching Pre-Algebra through Calculus.

ADJUNCT INSTRUCTOR
Mass Bay Community College; Wellesley Hills, MA   2005-2007
Teaching Algebra, Calculus I, Statistics.

ADJUNCT INSTRUCTOR
Pine Manor College; Chestnut Hill, MA   2004-2005
Teaching Pre-Algebra, Pre-Calculus.

ADJUNCT INSTRUCTOR
Middlesex Community College; Bedford, MA   Fall 2004
Teaching Pre-Algebra.

ASSISTANT PROFESSOR OF MATHEMATICS
Endicott College; Beverly, MA   2003-2004

Teaching Probability, Statistics, Student Advising, Tutoring.

VISITING ASSISTANT PROFESSOR OF MATHEMATICS
University of Vermont; Burlington, VT   2005-2008
Teaching Calculus I, Business Calculus, Number Theory.

INSTRUCTOR/ADVISOR BRANDEIS SUMMER ODYSSEY DIRECTED
RESEARCH PROGRAM
Brandeis University; Waltham, MA   Summers 2002, 2003
Involved teaching combinatorics and Mathematica. Also, helping students one
on one with a research problem: investigating a chosen problem, stating
conjectures, and proving conjectures.

GRADUATE STUDENT INSTRUCTOR
Brandeis University; Waltham, MA   1997-2002
Teaching Calculus.

INSTRUCTOR – BRANDEIS SUMMER SCHOOL
Brandeis University; Waltham, MA   Summer 2002
Teaching Calculus.

GRE REVIEW INSTRUCTOR FOR MCNAIR SCHOLARS PROGRAM
Brandeis University; Waltham, MA   Summer 1999
A program encouraging students of diverse socioeconomic and ethnic
backgrounds to attend graduate school.

COMMITTEES SERVED   FITCHBURG STATE UNIVERSITY
• Mathematics Assessment Committee
• Mathematics Technolgy Committee
• Mathematics Curriculum Committee
• Academic Policies Committee

PINE MANOR COLLEGE
• Quantitative Reasoning Committee
• Academics Ethics Committee
• Faculty Development Committee

RELATED EXPERIENCE   GRADER FOR VARIOUS UNDERGRADUATE COURSES
Brandeis University; Waltham, MA   1997-2003

MENTOR IN APPRENTICE PROGRAM
Brandeis University; Waltham, MA   1999-2001
For training new instructors.

TRAINING   WEBWORK CONSULTANT TRAINING
Lexington, KY   Summer 2011

APPRENTICESHIP PROGRAM
Brandeis University; Waltham, MA   1998

TA TRAINING
Brandeis University; Waltham, MA   Fall 1997

HONORS, GRANTS   FITCHBURG STATE COLLEGE OFFICE OF ASSESSMENT MINI–GRANT (WITH
DR. AMY WEHE)
Fitchburg State University; Fitchburg, MA   2010

BRANDEIS UNIVERSITY GRADUATE FELLOWSHIP
Brandeis University; Waltham, MA   1997-2002

OUTSTANDING TEACHING ASSISTANT AWARD
Graduate School of Arts and Sciences
Brandeis University; Waltham, MA   2000-2001

SUMMER SUPPORT FOR RESEARCH
Mathematics Department
Brandeis University; Waltham, MA   Summer 2000

GRADUATE STUDENT TEACHING AWARD
Mathematics Department
Brandeis University; Waltham, MA   1999-2000

JUAN CARLOS MERLO MEMORIAL AWARD
UMass Boston Mathematics Department
University of Massachusetts Boston; Boston, MA   1997

QUALIFICATIONS   WEBWORK CONSULTANT
Serve as ambassador for WeBWorK, an online, open source homework program, and train other teachers in the use of WeBWorK.

TALKS   MATH CLUB TALK
"The Infinitude of Primes"
Fitchburg State University; Fitchburg, MA   2009

VERMONT NUMBER THEORY SEMINAR
"Stark's Conjecture in the Octahedral Case"
University of Vermont; Burlington, VT   2002

SEMINAR ON GALOIS COHOMOLGY
Organized by Dr. Fred Diamond
Brandeis University; Waltham, MA   2001-2002

SECOND YEAR SEMINAR
Brandeis Mathematics Department
Brandeis University; Waltham, MA   1998-1999

MEMBERSHIPS   MAA
Mathematics Association of America

GOLDEN KEY HONORS SOCIETY

OTHER SKILLS   LANGUAGES
Proficient
  • English
Familiar
  • Spanish

OTHER INTERESTS   CREATIVE
Guitar and Piano
Photography

LEISURE
Bicycling
Hiking

CURRICULUM VITAE
MARK A. SNYDER
SEPTEMBER 15, 2011

1. PERSONAL DATA

Citizenship: U.S.

Languages: German (B2 level (4th out of 6 levels on European Union scale of fluency)), Russian (some reading, minimal speaking), Chinese (2nd year)

2. EDUCATION

B.S.: Mathematics, Massachusetts Institute of Technology (M.I.T.)

B.S.: Physics, M.I.T.

M.A.: Physics, Columbia University

Ph.D.: Mathematical Physics, Yale University

3. ACADEMIC POSITIONS

Sep. 2010– present: Professor of Mathematics, Fitchburg State University (formerly F. S. College)

2003– 2010: Associate Professor of Mathematics, Fitchburg State College

1992– 2003: Assistant Professor of Mathematics, Fitchburg State College

1985–1992: Research Scientist, Computer Vision Research Laboratory, Department of Computer Science, Univ. Mass., Amherst

1982–1985: Assistant Professor of Physics, Wellesley College, Wellesley, MA

1980–1981: Instructor in Physics, Wellesley College, Wellesley, MA

1979–1980: Instructor in Physics, Trinity College, Hartford, CT

1978–1979: Lecturer in Physics, Trinity College, Hartford, CT

4. RESEARCH

4.1 Research interests

Theoretical Computer Vision. Applications of mathematics, primarily group theory and differential geometry, to problems in computer vision, especially the theory of visual motion. Binocular motion processing. Robotics. Quantum Field Theory. Mathematical Physics generally.

4.2 Refereed Journal Publications

1. "A Commentary on the paper by Jain and Binford," Computer Vision, Graphics, and Image Processing: Graphic Models and Image Understanding, **53**, 118–119 (1991)

2. "On the Mathematical foundations of smoothness constraints for the determination of optical flow and for surface reconstruction," IEEE Transactions on Pattern Analysis and Machine Intelligence **13**, 1105–1114 (1991) (also, UMass COINS Tech. Rep. 89–05 (January 1989)

3. "The Precision of 3D parameters in correspondence-based techniques: the case of uniform translational motion in a rigid environment," IEEE Transactions on Pattern Analysis and Machine Intelligence **11**, 523–528 (1989) (also, UMass COINS Tech. Rep. 86–28 (June 1986)

4. "A two-parameter matrix Riccati equation pair for a class of nonlinear sigma models based on a symmetric space," Journal of Mathematical Physics **24**, 2204–2207 (1983)

5. "Quaternionic Multi-S^4 Instantons in General Covariant SU(2) Yang-Mills and HP(n) σ Models" (with M. A. Jafarizadeh and H. C. Tze), Nuclear Physics **B176**, 221–242 (1980)

4.3 Other Publications

1. "Frustum of a Pyramid Revisited," *Mathematics Teacher* **103** (1), 7–8 (August 2009)

2. "Problem 28, December 2007 Calendar," *Mathematics Teacher*, **102**, 171 (October 2008).

3. "Problem 14, April 2006," *Mathematics Teacher* **100** (6), 392 (Feb. 2007).

4. "A Starry Sun," Letter to the Editor, *The Boston Globe*, January 21, 2006.

5. "Calendar Problem 23, January 2001," *Mathematics Teacher* **95** (2), 118 (Feb. 2002).

6. " 'Calendar' Comments from M.A. Snyder," *Mathematics Teacher* **95** (6), 477–478 (September 2002).

7. "Analytical Connections with Triangular Numbers," *Mathematics Teacher* **94** (7), 550 (October 2001).

8. "Mike's Theorem Revisited," *Mathematics Teacher* **92** (4), 347 (April 1999).

4.4 Refereed Conference Presentations

1. "Smoothness Constraints in Computer Vision," MM5.6.1, Canadian Conference on Electrical and Computer Engineering, Toronto, Ontario, Sept. 13-16, 1992 [invited talk].

2. "Robustness of Structure from Binocular Known Motion," (with R. Dutta) IEEE Workshop on Visual Motion, Princeton, N.J. (October 1991).

3. "The p–field: A Computational Model for Binocular Motion Processing," (with P. Balasubramanyam) IEEE Conference on Computer Vision and Pattern Recognition, Honolulu, Hawaii (June 1991).

4. "Robustness of Correspondence-based Structure from Motion," (with R. Dutta) International Conference on Computer Vision. (December 1990).

5. "On the Mathematical Foundations of Smoothness Constraints for the Determination of Optical Flow and for Surface Reconstruction," IEEE Workshop on Motion, Irvine, Calif. (March 1989).

6. "Issues in Extracting Motion Parameters and Depth from Approximate Translational Motion," (with R. Manmatha, R. Dutta, and E. Riseman) IEEE Workshop on Visual Motion, Princeton, N.J. (October 1991).

7. "The Accuracy of 3D Parameters in Correspondence–Based Techniques: Startup and Updating," IEEE Workshop on Motion: Representation and Analysis, Charleston, S.C. (May 1986).

4.5 Technical Reports

1. "Robustness in Correspondence-based Structure from Motion," (with R. Dutta) UMass COINS Tech. Rep. 90–103 (December 1990)

2. "On the mathematical foundations of smoothness constraints for the determination of optical flow and for surface reconstruction II: General ISO(2) invariant constraints," UMass COINS Tech. Rep. 90–93 (October 1990)

3. "The complete enumeration of all possible smoothness constraints," UMass COINS Tech. Rep. 90–57 (October 1990)

4. "On the calculation of rigid motion parameters from the essential matrix," UMass COINS Tech. Rep. 89–102 (November 1989)

5. "On the mathematical foundations of smoothness constraints for the determination of optical flow and for surface reconstruction," UMass COINS Tech. Rep. 89–05 (January 1989)

6. "Issues in extracting motion parameters and depth from approximate translational motion," (with R. Manmatha, R. Dutta, and E. Riseman) UMass COINS Tech. Rep. 88–52 (May 1988)

7. "Computation of motion-in-depth parameters: a first step in stereoscopic motion interpretation," (with P. Balasubramanyam) UMass COINS Tech. Rep. 88–50 (May 1988)

8. "The problem of registration of dynamic image sequences," (with I. Pavlin) UMass COINS internal report (1987)

9. "The Precision of 3D parameters in correspondence-based techniques: the case of uniform translational motion in a rigid environment," UMass COINS Tech. Rep. 86–28 (June 1986)

10. *Matrix Riccati Equations for a Class of Nonlinear Sigma Models based on a Symmetric Space*, Ph. D. Thesis, Yale University, December 1982

11. "On the Vortex Equations of Bogomol'nyi," Physics Department preprint, Yale University (1979)

12. *Post-Newtonian Approximation to Einstein's Equations for a Viscous Incompressible Fluid*, B. S. Thesis, Physics Department, M.I.T., June 1971

4.6 Unrefereed Conference Publications

- "Robustness of Correspondence–based Structure from Motion," (with R. Dutta) Proc. Defense Advanced Research Projects Agency Image Understanding Workshop, Pittsburgh, PA, Sept. 13–15, 1990, pp. 299–306.

- "The mathematical foundations of smoothness constraints: a new class of coupled constraints," Proc. DARPA IU Workshop, Pittsburgh, PA, Sept. 13–15, 1990, pp. 154-161.

- "On the mathematical foundations of smoothness constraints for the determination of optical flow and for surface reconstruction," Proc. DARPA IU Workshop, Palo Alto, CA, May 23–26, 1989, pp. 1070-1075.

- "Computation of motion-in-depth parameters: a first step in stereoscopic motion interpretation," (with P. Balasubramanyam) Proc. DARPA IU Workshop, Cambridge, MA, May 23–26, 1989.

- "Issues in extracting motion parameters and depth from approximate translational motion," (with R. Dutta, R. Manmatha, and E. Riseman) Proc. DARPA IU Workshop, Cambridge, MA, May 23–26, 1989.

- "Uncertainty analysis in image measurements," Proc. DARPA IU Workshop, Los Angeles, CA, Feb. 1987.

4.7 Supervised Research

- Mary Longtin (Wellesley College) "Symmetry Principles and the Graphic Art of M. C. Escher" (B. A. Physics) 1983.

- Christy Smith (Wellesley College) "Musical Acoustics" (B. A. Physics) 1983.

- Poornima Balasubramanyam (UMass Amherst) "Combining Stereo and Motion to Compute Motion-in-depth Parameters" (M. S. Computer Science) 1988.

- Inigo Thomas (UMass Amherst) "A Kalman Filtering Approach to Combining Depth Maps" (M. S. Computer Science) 1990.

- Poornima Balasubramanyam (UMass Amherst) "Stereoscopic Motion" (Ph.D. Computer Science) 1993 [co-advisor with Prof. Allen Hanson of UMass].

- Rabindranath Dutta (UMass Amherst) "Robustness of Correspondence-based Structure from Motion" (Ph.D. Computer Science) 1993 [co-advisor with Prof. Allen Hanson of UMass].

5. EDUCATION ACTIVITY (RECENT)

1. One-week in-service course on "The Physical Science of the Solar System" for K–12 teachers, co-presented with Prof. Elizabeth Gordon (Geophysics), June 2010, with follow-up sessions in Fall 2010.

2. One-week in-service course on "The Physics of Animal Adaptation" for K–12 teachers, co-presented with Prof. Christopher Cratsley (Biology), July 2009, with follow-up sessions in Fall 2009.

3. One-week in-service course on "The Physical Science of Life" for K–12 teachers, co-presented with Prof. Christopher Cratsley (Biology), July 2008, with follow-up sessions in Fall 2008.

4. I am an active contributor to the AP-Calculus electronic discussion group, with over 1000 posts during the period 2004–2010.

5. Presentation on mental arithmetic, and the geometric series, to the AP Calculus class at Oakmont Regional HS, May 2010.

6. Developed the syllabus for the course Informal Number Theory (Math 1500), now required of all Elementary Education majors at Fitchburg State College. I have taught the course 7 times since its introduction in Spring 2008.

7. Responsible for the Secondary Education program in the Mathematics Department, as well as for the Post-Baccalaureate Education program in Mathematics. I have supervised the Practicum of 9 undergraduate students since 2004, and the Practicum of 6 Post-Baccalaureate students.

8. Wrote the report of the Secondary Education program for NCATE accreditation in 2004 and 2008. Our program received approval (with conditions).

9. Member of the Education Unit at Fitchburg State College, attending all meetings of the Unit. I have also been an active member of the Assessment Committee of the Education Unit for the last seven years.

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Peter L. Staab

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Fitchburg State College
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Fitchburg, MA 01420

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Phone: 978-665-4857
email: pstaab@fitchburgstate.edu
url: http://falcon.fsc.edu/pstaab/

Current position

since 2006   *Associate Professor*, Department of Mathematics, Fitchburg State University. (Note: promoted to Associate Professor in 2011).

Previous Academic Positions

2003–2006   Lecturer; Tufts University, Medford, Massachusetts
1999–2003   Visiting Professor; Colorado College, Colorado Springs, Colorado
1998–1999   Postdoctoral Research Assistant; University of Colorado, Boulder, Colorado

Education

1998   Ph. D. Applied Mathematics; University of Colorado at Boulder
1996   M. S. Applied Mathematics; University of Colorado at Boulder
1992   Honors, B. S. Mathematics; University of Utah
1992   B. S. Chemistry; University of Utah, 1992

Research

Dissertation Title: Three-Dimensional Flows in Solid Fuel Rocket Motors

General Fields Interest: Image Processing, Fluid Mechanics, Dynamical Systems, Numerical Analysis, Partial Differential Equations, Mathematical Pedagogy

Current Research Topics: Symmetries of Magic Squares.

Past Research Topics: Active Contours, Edge Detection, Level-Set Method, Flows in Solid Fuel Rocket Motors.

1

Publications & talks

Journal articles

2011   Peter Staab, Charles Fisher, Mark Maggio, Michael Andrade, Erin Farrell, Haley Schilling; *The Magic of Permutation Matrices: Categorizing, Counting and the Eigenspectra of Magic Squares*, **(in prepration)**

2005   Eric Leonard, Peter Staab, Stephen Weaver; *Flow Kinematics of Spruce Creek Rock Glacier, Colorado*, Journal of Glaciology, **51** (2005) 259-268

Peter Staab, Michael Rempe, David Kassoy; *Thermal Dynamics in a Cylinder with Sidewall Mass Addition*, SIAM Journal of Applied Mathematics, **65** (2005) 587-617

2002   Peter Staab, David Kassoy; *Three-dimensional flow in a cylinder with sidewall mass addition*, Physics of Fluids, **14** (2002) 3141-3159

2000   Peter Staab, David Kassoy; *Acoustically Generated Vorticity in an Internal Flow*, Journal of Fluid Mechanics, **41** (2000) 247-285

1999   Peter Staab, David Kassoy; *Axisymmetric Acoustic-Rotational Flow Model of a Cylinder with Sidewall Mass Addition*, Physics of Fluids, **11** (1999) 2935-2951

1996   Peter Staab, David Kassoy; *Three-Dimensional, Unsteady, Acoustic-Shear Flow Dynamics in a Cylinder with Sidewall Mass Addition*, Physics of Fluids, **9** (1996) 3753-3763

Problem Solutions

2008   Solution to Problem #214, p. 33, Math Horizons (September 2008).

Talks

2011   *Teaching a Mathematics Course Using a Wireless Tablet*, Summer Institute VII, Center for Teaching and Learning, Fitchburg State University, Fitchburg, MA (August 2010)

What's new in Blackboard 9.1, Summer Institute VII, Center for Teaching and Learning, Fitchburg State University, Fitchburg, MA (August 2011)

How many unique 4 by 4 magic squares exist?, Pi Mu Epsilon Honor Society Induction Ceremony, Fitchburg State University, Fitchburg, MA (March 2011)

Teaching a Mathematics Course Using a Wireless Tablet, Joint Mathematical Meeting, New Orleans, LA, (January 2011)

2010   *Using Wimba to Communicate with your Students*, Center for Teaching and Learning, Fitchburg State University, Fitchburg, MA (November 2010)

Producing Slides in LaTeX, Meeting of the TeXUsers Group, Center for Teaching and Learning, Fitchburg State College, Fitchburg, MA (September 2010)

Introduction to Blackboard 8, Center for Teaching and Learning, Fitchburg State College, Fitchburg, MA (September 2010)

Using a Macintosh on the Fitchburg State College Campus, Summer Institute VI, Center for Teaching and Learning, Fitchburg State College, Fitchburg, MA (August 2010)

Using the Grade Center in Blackboard 8, Center for Teaching and Learning, Fitchburg State College, Fitchburg, MA (May 2010)

Time-Saving Shortcuts in LaTeX, Meeting of the TeXUsers Group, Center for Teaching and Learning, Fitchburg State College, Fitchburg, MA (May 2010)

Permutation Matrices and Symmetries of Magic Squares, Harrod Lecture, Fitchburg State College, Fitchburg, MA (February 2010)

Editing WeBWorK Pages, CTL Brown Bag, Fitchburg State College, Fitchburg, MA (January 2010)

The Role of Permutation Matrices in Magic Squares, Joint Mathematical Meeting, San Francisco CA, (January 2010)

2009   *Using OSX's Mail, iCal & Address Book with MS Exchange*, Meeting of the MAC Users Group, Fitchburg State College, Fitchburg, MA (September 2009)

Using a Macintosh on the Fitchburg State College Campus, Summer Institute V, Center for Teaching and Learning, Fitchburg State College, Fitchburg State, MA (August 2009)

Determinants and Eigenvalues of Magic Squares, Hudson River Undergraduate Mathematics Conference, Schenectady, NY (April 2009)

Using LaTeX to present Mathematics without PowerPoint in a PowerPoint world, Meeting of the Tex Users Group, Center for Teaching and Learning, Fitchburg State College, Fitchburg, MA (March 2009)

Using WebWorK, an Open-Source, Online-Homework System in Mathematics Classes, Center for Teaching and Learning, Fitchburg State College, Fitchburg, MA (February 2009)

2008   *Democracy and Mathematics:Your Vote Counts?*, Department of Mathematics Seminar, Fitchburg State College, Fitchburg, MA (October 2008)

Using a Macintosh on the Fitchburg State College Campus, Summer Institute IV, Center for Teaching and Learning, Fitchburg State College, Fitchburg State, MA (July 2008)

Teaching Linear Algebra in a Finite Mathematics Course using WebCAS, Undergraduate Teaching and Research Conference; Montclair, New Jersey (June 2008).

Everything you wanted to know about e^x but were afraid to ask, Department of Mathematics Seminar, Fitchburg State College, Fitchburg, MA (April 2008).

The Sigmoid Function, a differential equations approach, Hudson River Undergraduate Mathematics Conference, Canton, NY (April 2008)

Using Online Homework systems like MyMathLab: a panel discussion, Center for Teaching and Learning, Fitchburg State College, Fitchburg, MA (January 2008),

Teaching Linear Algebra in a Finite Mathematics Course using WebCAS, Joint Mathematical Meetings, San Diego, CA (January 2008)

2007   *Teaching Precalculus Online at Fitchburg State*, Center for Teaching and Learning, Fitchburg State College, Fitchburg, MA (October 2007),

Linear Algebra and Linear Programming in a Finite Mathematics Class, Faculty Center Talk; Center for Teaching and Learning, Fitchburg State College, Fitchburg, MA (March 2007)

Linear Algebra and Linear Programming in a Finite Mathematics Class; ICTCM conference, Boston, MA (February 2007)

2005   *Fitting Surface Strain Glacier Data to an Ellipse*; Seattle University, Seattle, WA (April 2005)

Constrained Active Contours and Segmentation of Digital Images University of Washington, Bothell, Seattle, WA (April 2005)

2004   *Non-negative Matrix Factorization*, Mathematics Department Colloquim Series; Tufts University, Medford, MA (January 2004)

2002   *Edge Detection in Digital Images using the Level-Set Method*, Fearless Friday Series, Mathematics Department; Colorado College, Colorado Springs, CO (December 2002)

2001   *Introduction to XML*, Fearless Friday Series, Mathematics Department; Colorado College, Colorado Springs, CO (December 2001)

Designing Graphical Software with Java, Mathematical Java Conference, Emporia State University; Emporia, KS (June 2001)

2000   *Eigenspaces of Magic Squares*, Fearless Friday Series, Mathematics Department; Colorado College, Colorado Springs, CO (October 2000)

Finite-Difference Techniques and the Method of Lines, Mathematics Department Series; Colorado College, Colorado Springs, CO (March 2000)

Parsing Mathematical Expressions, Mathematics Department Student Talk; Colorado College, Colorado Springs, CO (March 2000)

1999   *Thermal Response to Flow in a Cylinder with Sidewall Mass Addition*, American Physical Society, Division of Fluid Dynamics Conference; New Orleans, LA (November 1999)

Using Java to Plot Revenge Against the big M's, Fearless Friday Departmental Series; Colorado College, Colorado Springs, CO (October 1999)

1998   *Non-Axisymmetric Acoustic-Rotational Flow in a Cylinder with Sidewall Mass Addition*, American Physical Society, Division of Fluid Dynamics Conference; Philadelphia, PA (November 1998)

1997   *Non-Axisymmetric Acoustic-Rotational Flow in a Cylinder with Sidewall Mass Addition*, American Physical Society, Division of Fluid Dynamics Conference; San Francisco, CA (November 1997)

Integrating Technology in the Mathematics Classroom, Conference on Teaching, Learning and Technology; Golden, CO (July 1997)

Non-Axisymmetric Acoustic-Rotational Flow in a Solid Rocket Motor, 28th AIAA Fluid Dynamics Conference; Snowmass, CO (June 1997)

1996   *Non-Axisymmetric Acoustic-Rotational Flow in a Cylinder with Sidewall Mass Addition*, Los Alamos-Colorado Days; Los Alamos, NM (March 1996)

1995   *The Effectiveness of Help Groups in First Year Calculus*, Applied Math Seminar; Department of Applied Mathematics, University of Colorado at Boulder, Boulder, CO (November 1995)

Conference Proceedings

2000   Peter Staab, David Kassoy, *Thermal Response for an Internal Flow in a Cylinder with Time-Dependent Sidewall Mass Addition*; 31th AIAA Conference, Reno, NV (2000)

1997   Peter Staab, David Kassoy, *Co-Existing Acoustic-Rotational Disturbances in a Coldflow Model of a Solid Rocket Motor*; 28th AIAA Fluid Dynamics Conference, Snowmass, CO (1997)

Peter Staab, David Kassoy, *Co-Existing Acoustic-Rotational Disturbances in a Coldflow Model of a Solid Rocket Motor*; 28th AIAA Fluid Dynamics Conference, Reno, NV (1997)

Teaching

The following is a list of courses taught at Fitchburg State University/College, Tufts University, Colorado College and the University of Colorado at Boulder and the dates of each course.

2011   Operations Research (Spring 2011)

Finite Mathematics (Spring 2011, Fall 2010, Fall 2009, Spring 2009, Fall 2008, Spring 2008, Spring 2007, Fall 2006, Spring 2006)

2010   Numerical Analysis (Fall 2010,Fall 2008,May 2002, May 2000),

Informal Mathematical Modeling (Spring 2010)

Mathematics Seminar (Spring 2010)

Methods in Applied Mathematics (Spring 2010)

2009   Calculus III (Fall 2009, Spring 2006, Fall 2005, Spring 2005, Summer 2004, Fall 2003, Summer 2003)

Ordinary Differential Equations (Spring 2009, Summer 2006, Spring 2006, Summer 2005, Summer 2008   2004, Summer 1997)

Calculus I (Spring 2008, Fall 2007, Summer 2005, September 2002, April 2002, January 2001, Summer 1996)

Precalculus (Summer 2008, Summer 2007, Spring 2007, Fall 2006)

2007   Mathematical Modelling (Fall 2007)

Calculus II (Spring 2007, Fall 2006, Summer 2005, Spring 2005, Fall 2004, Spring 2004, October 2000)

2003   Introduction to Calculus (Fall 2003, Spring 2004, Fall 2004, Fall 2005)

2003   Introduction to Probability and Statistics (February 2003, December 2002, January 2002, November 2001, November 2000, July 2000, April 2000)

2002   Chaos and Computing (October 2002),

Introduction to Computer Science (November 2002, September 2001, September 2000, November 1999, September 1999),

Dynamical Systems (July 2002),
2001   Fourier Analysis (October 2001),
Dynamic Web Design (Summer 2001),

2001   Object-Oriented Computing (May 2001),
Digital Computing (April 2001, December 1999),
1999   Discrete Mathematics (October 1999),
Introduction to Numeric and Symbolic Computation (Spring 1999)

CV of Peter Staab

Committees

All committees listed here occurred at Fitchburg State University.

2010–2011	Undergraduate Conference on Research and Creative Practice organizing Committee (chair)
2010–2011	NEASC Report, Standards 7,8,9 subcommittee
2010–2011	All College Committee, Academic Policies Committee (secretray)
2006–2010	Math Department Curriculum Committee
2008–2011	Math Department Assessment Committee (except '09-'10 AY)
2007–2011	Math Department Hiring Committee (three hires, Chair, 2009, 2011)
2007	Math Department Calculus Book Committee (March 2007)
2006–2010	Haskins Contest Committee
2006–2009	Math Department IT Committee (chair)
2006–2010	FSC Technology Advisory Committee (chair 2007-2009)
2007–2008	Center For Teaching and Learning Executive Board

Departmental and College-wide service activities

2010–2011	Organizer of the Undergraduate Conference for Research and Creative Practice, Fitchburg State University
2009–2011	Co-Director of the Center for Teaching and Learning, Fitchburg State University
2005	Mentoring a Graduate Student for co-teaching, Mathematics Department, Tufts University (Summer 2005)
1999–2003	Advisor for the COMAP Mathematical Modelling Contest, Mathematics Department, Colorado College
2001–2002	Advisor for the Putnam Mathematical Contest, Mathematics Department, Colorado College
2002–2003	Mathematics Department Representative for Admissions Committee, Colorado College (September 2002-2003)
2002-2003	Mentoring a 5th grade Colorado Springs student, Mathematics Department, Colorado College (November 2002-Summer 2003)

CV of Peter Staab

Grants, honors & awards

2011   *Academic Affairs Student Research Grant*, Fitchburg State University

2010   *Harrod Lecture Invitee*, Fitchburg State College

2008–2009   *Research Fellow*, Fitchburg State College

2007   *Innovation Grant*, Fitchburg State College (Spring 2007)

2002   *National Sciences Division Research Grant*, Colorado College (Summer 2002)

1997   *Applied Mathematics Graduate Student Teaching Award*, Applied Mathematics Department, University of Colorado at Boulder (June 1997)

1995   *Applied Mathematics Graduate Student Teaching Award*, Applied Mathematics Department, University of Colorado at Boulder (June 1995)

1995   *Graduate Fellowship*, Applied Mathematics Department, University of Colorado at Boulder (June 1995)

Other academic activities

2009–2011   Judge and Scorer for Undergraduate Poster Session, Joint Mathematics Meetings.

2000–2001   Independent Study and Distinction Advisor for Peter Johnson, Centroid Analysis of Star from a Dynamic Starfield Colorado College, Colorado Springs, CO (July 2000 to May 2001)

1999   Development of Mathematical Visualization Toolkit using Java, University of Colorado Boulder (Summer, 1999)

1997–1998   Applied Mathematics Preparing Future Faculty Fellow, University of Colorado, Boulder (1997-1998)

1996–1997   Applied Mathematics Lead Teaching Assistant, University of Colorado at Boulder (June 1996 to June 1997)

1995–1998   Applied Math Graduate Student Talks (six total), Applied Mathematics Department, Boulder, Colorado

1994–1996   Member of the Applied Math Graduate Student Organization, Applied Mathematics Department, University of Colorado at Boulder

Amy Wehe
(formerly Amy Wangsness)

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Education

PhD in Mathematics; Iowa State University, Ames, IA; May 2005
Dissertation title: The matrix completion problem for various classes of $P_{0,1}$-matrices.
Bachelor of Arts in Mathematics; Minor in Business
Drake University, Cum Laude, Des Moines, IA; December 1998
    Iowa Teaching License: Secondary Mathematics and Business

Awards

Mathematics Association of America Dolciani Mathematics Enrichment Grant. Awarded to Amy Wehe and Tomm Gamache to run a Math Circle at the Fitchburg Arts Academy during the 2010-2011 Academic Year. The Math Circle is a weekly after school enrichment program for students interested in learning mathematics beyond the regular school curriculum.

Assessment Mini-grant Spring 2010. Awarded to Amy Wehe and Bruce Romano to use the mathematics technology rubric to assess student work in Calculus I and II in TK-20 and report on the results at Assessment Day, May 2010.

Project NExT Leitzel Fellow. Project NExT is a national professional development program for new professors in mathematics. Fewer than 50% of applicants are accepted into the program. My participation in the program was funded by Fitchburg State University and money given to Project NExT in memory of James Leitzel.

Aggie Ho Award for Research in Pure Mathematics for 2005. Given each year to one student of pure mathematics in the Department of Mathematics at Iowa State University.

Teaching Excellence Award, May 2003. Given in recognition of outstanding contributions to the teaching of undergraduate students at Iowa State University while working toward a graduate degree. Only the top 10% of graduate assistants in each department receive this award.

The Outstanding Student in Mathematics Education Award, April 1998. Given each year to one student in the Department of Mathematics and Computer Science at Drake University.

Teaching Experience

Assistant Professor, *Fitchburg State University*, Fitchburg, MA, September 2005-present. My duties include full-time teaching responsibilities, office hours, scholarly activity, advising, and service to the university and to the community.

Graduate Assistant, *Iowa State University*, Ames, IA, August 1999-July 2005.
My duties included full responsibility for teaching one course per semester.

Graduate Mentor, Iowa State University Research Experience for Undergraduates Program, Ames, IA, June-July 2004. I assisted the undergraduate students working on the Fischer Matrix Completion Problem project in their research by listening to their ideas, making suggestions, and encouraging them. For more information on this program, please view the website at http://orion.math.iastate.edu/reu/REU04.html.

Practice Group Leader for Linear Algebra, _Universität Augsburg_, Augsburg, Germany, October 2001-July 2002. I led a discussion group in German, and graded students' homework assignments.

Student Teaching Professional Semester, _Norwalk Middle School_, Norwalk, IA, Aug.-Dec. 1998. My duties included teaching 8th grade Pre-Algebra and Algebra and facilitating cooperative and collaborative lessons.

Works in Progress

Wangsness Wehe, Amy; Dealba, Luz; McDonald, Judith; Some Outerplanar Graphs for which $mr^-(G) = MR^-(G)$. Work on this paper began at the CBMS conference in Ames, IA in summer 2010.

Publications

Wehe Wangsness, Amy and 15 other authors; Minimum rank of skew-symmetric matrices described by a graph— IMA-ISU research group on minimum rank. _Linear Algebra and Its Applications,_ v432, 2010, pgs. 2457-2472.

Wehe Wangsness, Amy and 17 other authors; Zero forcing sets and the minimum rank of graphs. AIM minimum rank—special graphs work group report. _Linear Algebra and Its Applications_ v428, 2008, pgs. 1628-1648.

Wehe Wangsness, Amy; Kim, In Jae; Open Questions on the AIM workshop "Spectra of families of matrices described by graphs, digraphs, and sign patterns," http://aimath.org/WWN/matrixspectrum/matrixspectrum.pdf

Hogben, Leslie; Wangsness, Amy. Matrix completion problems. _Handbook of Linear Algebra_, Taylor & Francis Group, LLC, 2007, pgs. 35-1—35-12.

De Alba, Luz Maria; Hardy, Timothy L.; Hogben, Leslie; Wangsness, Amy. Minimum Rank and Maximum Eigenvalue Multiplicity of Symmetric Tree Sign Patterns. _Linear Algebra and Its Applications_ v418, 2006, pgs. 394-415.

Bowers, John; Evers, Job; Hogben, Leslie; Shaner, Steve; Snider, Karyn; Wangsness, Amy. On Completion Problems for Various Classes of _P_-matrices. _Linear Algebra and Its Applications_ v413, 2006, pgs. 342-354.

De Alba, Luz Maria; Hardy, Timothy L.; Hogben, Leslie; Wangsness, Amy. The (Weakly) Sign Symmetric _P_-matrix Completion Problems. _Electronic Journal of Linear Algebra_ v10, 2003, pgs.257-271.

Choi, Ji Young; De Alba, Luz Maria; Hogben, Leslie; Maxwell, Mandi S.; Wangsness, Amy. The P_0-matrix Completion Problem. _Electronic Journal of Linear Algebra_ v9, 2002, pgs.1-20.

Presentations

Peer-Reviewed Invitational Talks

Discussions on when $mr^-(G) = MR^-(G)$ _in Skew Symmetric Matrices._ International Linear Algebra Society Conference, Braunschweig, Germany, August 22-26, 2011.

When $mr^-(G) = MR^-(G)$ _in Skew Symmetric Matrices._ American Mathematical Society Sectional Meeting 2010, Richmond, VA, November 6-7, 2010.

Journal Forms to Test Student's Understanding. Math Fest 2008, Madison, WI, August 2, 2008.

Some results on the matrix completion problem for various classes of $P_{0,1}$-matrices. Fall Central AMS Section Meeting, Lincoln, NE, October 21-23, 2005.

Playing with matrices—will they always do what we want them to? Fall 2006 meeting of the Northeastern Section of the Mathematical Association of America, Fairfield, CT, November 17-18, 2006.

The P_0-matrix completion Problem. 2001 Iowa Mathematics Meeting, Joint Meeting of MAA and ASA, Drake University, Des Moines, IA, April 6, 2001.

Talks at Fitchburg State University

Innovative Practices in Online Learning. Amy Wehe and Paul Beaudoin. Graduate and Continuing Education Fall Faculty Meeting and Professional Development Workshops, Fitchburg State University, September 1, 2010.

Applying the Math Technology Rubric. Amy Wehe and Bruce Romano. Spring Assessment Day, Fitchburg State University, May 25, 2010.

Conversations about on-line courses. Amy Wehe and Christine Devine. Center for Teaching and Learning, Fitchburg State University, November 23, 2009.

Using Online Tools in Teaching and Learning. Amy Wehe and 5 other presenters. Center for Teaching and Learning, Fitchburg State University, January 30, 2008.

Maple tutorial. Presented by Amy Wehe and Peter Staab. Fitchburg State University, Wednesday, September 27, 2006.

Talks at Other Colleges

Playing with matrices—will they always do what we want them to? Mathematics and Computer Science Departments' Faculty Research Colloquium, Framingham State University, Thursday, April 12, 2007.

Playing with matrices—will they always do what we want them to? Mathematics Colloquium, Washington State University, Friday, March 2, 2007.

Playing with matrices—will they always do what we want them to? Department of Mathematics Colloquium Series, Western New England College, Monday, December 4, 2006.

Playing with matrices—will they always do what we want them to? CS/Math Club Meeting, Worcester State University, Tuesday, December 6, 2005.

Report on graph theory from AMS Atlanta meeting. Discrete Mathematics Seminar at Iowa State University, Ames, IA, January 13, 2005.

Results on completion problems for classes of $P_{0,1}$-matrices. Linear Algebra Seminar at Iowa State University, Ames, IA, November 30, 2004.

Post-Mortem on the Extremal Combinatorics session of the Central Sectional Meeting of the AMS. (with Ryan Martin and Maria Axenovich), Discrete Mathematics Seminar at Iowa State University, Ames, IA, October 29, 2004.

Sign Symmetric $P_{0,1}$-Matrix Completion Problem. Linear Algebra Seminar at Iowa State University, Ames, IA, March 25 and April 1, 2004.

The P_0-matrix completion Problem. Linear Algebra Seminar at Iowa State University, Ames, IA, March 29 and April 19, 2001.

<u>**Conferences and Workshops Attended**</u>

International Linear Algebra Society Conference, August 22-26, 2011, Braunschweig, Germany (Co-organized mini-symposium, speaker).

AMS Sectional Meeting, November 6-7, 2010, Richmond, VA (Speaker, collaborated).

2010 NSF-CBMS Regional Conference on the Mutually Beneficial Relationship of Matrices and Graphs, July 21-16, 2010, Ames, IA (Attended, collaborated).

MAA Northeastern Sectional Meeting Fall 2009, November 20-21, Western New England College, Springfield, MA (Attended).

Math Fest 2008, July 31-August 2, 2008, Madison, WI (Speaker, attended minicourse "How to Run a Successful Math Circle" and Project NeXT course "Teaching Statistics").

IMA workshop on Linear Algebra and Applications, June 30-July 25, 2008. Iowa State University, Ames, IA (Attended, participated in research group).

Sixth Annual Northeastern Section of the Mathematical Association of America (NES/MAA) Dinner Meeting May 8, 2008, in Memory of Kenneth J. Preskenis, Framingham State University, Framingham, MA (Attended).

NES/MAA Fall 2007 Meeting November 16-17, 2007 Framingham State University, Framingham, MA (Attended).

"Math at Work" Conference October 27, 2007, Bentley College, Waltham, MA (Attended with Fitchburg State University students).

XIVth Hudson River Undergraduate Mathematics Conference, April 21, 2007, Siena College, Loudonville, NY (Attended with Fitchburg State University students).

AIM Workshop, October 23-27, 2006, Palo Alto, CA (Invited).

Math Fest 2006, August 10-12, 2006, Knoxville, TN (Project NExT Fellow, overall co-organizer of the sessions organized by the Project NExT 2005-06 Fellows, co-organizer of the session "Creating and Recreating Courses").

XIIVth Hudson River Undergraduate Mathematics Conference, April 8, 2006, Westfield State University (Attended with Fitchburg State University students).

Joint Mathematics Meetings, January 12-15, 2006, San Antonio, TX (Project NExT Fellow, Poster Competition Judge).

Fall Central AMS Section Meeting, October 21-23, 2005, Lincoln, NE (Invited speaker).
Math Fest 2005, August 4-6, 2005, Albuquerque, NM (Project NExT Fellow).

Brualdi Fest, April 30-May 1, 2005, Madison, WI (Attended).

Joint Mathematics Meetings, January 5-8, 2005, Atlanta, GA (Attended).
- Minicourse "Getting Students Involved in Undergraduate Research"
- MAA short course "Eight Lectures on Random Graphs"

Central Meeting of the American Mathematical Society, October 23-24, 2004, Evanston, IL (Attended special session in extremal combinatorics).

Siam Conference on Applied Linear Algebra, July 15-19, 2003, College of William and Mary, Williamsburg, VA (Attended).

Topics in Linear Algebra Conference, September 13-14, 2002, Iowa State University, (Local organizer).

Rocky Mountain Mathematics Consortium, July 23-August 1, 2001, University of Wyoming (Selected to receive stipend). Topic: Combinatorics and Matrix Theory.

2001 Iowa Mathematics Meeting, Joint Meeting of MAA and ASA, April 6, 2001, Drake University, Des Moines, IA (Speaker).

Professional Organizations and Memberships

American Mathematical Society
International Linear Algebra Society
Mathematical Association of America plus Special Interest Groups of the MAA (SIGMAA) on History of Mathematics and on Math Circles
Pi Mu Epsilon

Organized Presentations and Programs

Middle School Math Circle at Fitchburg Arts Academy funded by the MAA Dolciani Enrichment Grant. I lead a group of middle school students who meet weekly after school to do mathematics and problem solving activities.

Organized and proctored the American Mathematics Contest 10/12 (AMC 10/12), 2009-2011. The AMC10 is a mathematics contest written and sponsored by the Mathematical Association of America and the American Mathematical Society for 8-12th grade students, given in February each year. I organize the administration of this exam at Fitchburg State University.

Math Awareness Month Speaker Robert Devaney at Fitchburg State University, April 5, 2011 titled "Chaos Games and Fractal Images," organized in conjunction with the Math Club.
What to do with a Math Major? Panel of four mathematics alumni, Jessica Belanger, Michael Krul, Robert Allaire, and Ken Pagington, about how they are using their mathematics major and what advice they have for current students on job seeking.

Math Awareness Month Speaker Richard Cleary at Fitchburg State University, April 21, 2010 titled "Some Non-Standard Applications of Mathematics to Sports," organized in conjunction with the Math Club.

Talk by Bruce Romano at Fitchburg State University, October 20, 2009, titled "The Infinitude of Primes".

Talk by Angela Vierling-Claassen at Fitchburg State University, November 6, 2008, titled "Mathematical Models and Modern Art".

Talk by Victoria Sapko, Fitchburg State University, October 25, 2007, titled "Postage Stamp Problems".

Helped organize the *TeX Users' Group* (TUG) at Fitchburg State University. TUG is a group who share their knowledge of using LaTeX, a software program used to write mathematical and scientific symbols.

Started a Math Circle on Campus, which is a group of people who meet to work on interesting and challenging math problems because they want to. The first math circle was held on October 16, 2008 and has met once or twice per semester since then.

Talk by Jennifer Beineke, Fitchburg State University, April 2007 titled "Splendor in the Graphs".

Program for the 2005-06 Project Next Fellows, Math Fest, Knoxville, TN, August 9, 2006.

Panel "Creating and Recreating Courses" for Project NExT Program at Math Fest, Knoxville, TN, August 9, 2006.

Talk by Hansun To, Fitchburg State University, March 2006 titled "Applying Mathematics in the Real World".

Other Mathematical Activities

Co-Organized Young Researchers Mini-symposium on Combinatorial Matrix Theory at the ILAS meeting, August 22-26, 2011, Braunschweig, Germany.

Developed Online Applied Statistics Course, 2008-09. I designed this course throughout AY2008-09 and taught the course for the first time in Summer 2009.

Scored exams for the AP Calculus Exam for the College Board Advanced Placement Program, June 2007, 2008, 2010, 2011.

Reviewed the paper "On a problem of Peris and Subiza", by Sachindranath, Jayaraman and K.C. Sivakumar, submitted for possible publication in Linear Algebra and its Applications in 2007.

Participated in a Focus Group for McGraw-Hill, Boston, MA, February 2006. Participants were shown components of a new online course system and asked specific questions about what they thought of it, what they would change, and what else they would like to see.

Reviewed Precalculus Textbook written by Sheldon Axler in June 2006 before publication by Wiley publishing.

Other Activities

Math Club Advisor, 2009-present.

Faculty Moderator, Undergraduate Conference on Research and Creative Practice, Fitchburg State University, April 21, 2011.

Participated as a "Host Family" for an International Student, 2006-2011, as part of a program organized by the Office of International Education at Fitchburg State University.

Volunteered for Commencement, Fitchburg State University, May 2007.

Participated as a Mentor in the Mentor/Mentee Program by mentoring a new faculty member, Jennifer Berg, 2008-09.

Represented department at the Open House/Accepted Students Day, October 13, 2007, November 1, 2008, October 31, 2009, October 16, 2010, April 21, 2010.

Ran election for Department Chair, Spring 2006.

Selected Talks and Discussions Attended organized by and/or led by Fitchburg State Faculty/Librarians/Staff including: *Assessment Afternoon Conversations on the Communication Rubric* and *on the Problem Solving Rubric*, led by Benjamin Railton and Chris Picone, April 2011; Hands-on session with wireless tablets and Mimio bar, Peter Staab, April 23, 2010; *Harrod Lecture: Magic Square,* by Peter Staab, February 23, 2010; *CTL session on Problem Based Learning* by Jessica Robey, February 18, 2010; *CTL Session on Using Smartboards*, November 17, 2009 by Jennifer Berg; *Harrod Lecture: The Development of Sex Differences in Math*, by Laura Garofoli; *On Writing Numbers* by Thomas Garrity organized by the Math Club; *Making Connections Across the Academy*, CTL Brownbag by Jennifer Berg and Jon Krasner; *Clickerfest 2008*, organized by Thomas Schoenfeld; *Life After Undergraduate Mathematics*, organized by Mary Ann Barbato for the mathematics undergraduate students, March 6, 2007; *Scaffolding as a Technique*, organized and led by Laura Garofoli and Chris Picone, sponsored by the Faculty Center for Teaching and Learning, April 11, 2007; *Quality Assurance in Online Courses*, led by George Bohrer, March 8, 2007; *Forum on Academic Integrity*, sponsored by the Faculty Center of Teaching and Learning and Shawn McGuirk (Director of Student Conduct), March 6, 2007.

Committees

All College Committee 2009-2011, **All College Committee Curriculum Committee** 2006-2009**, Leadership Academy Committee** 2005-07**, Technology Advisory Committee** 2005-2006, **REDI Editorial Board** Spring 2010-2011, **Departmental Assessment Committee** 2008-2011, **Hiring Committee** 2010-1011, **PEC Committee** Fall 2010, **Departmental Seminar Committee** 2005-2011**, Department Curriculum Committee** 2005-2009 **(chair** 2006-2009**), Departmental Technology Committee** 2006-2009**, Departmental Ad Hoc Calculus Committee** 2006-2007**, Elizabeth Haskins Mathematics Contest Committee** 2005-2011.

PERSONAL DATA:
   Name: Abdulkeni A. Zekeria
   Address: Fitchburg State University
           160 Pearl Street
            Fitchburg MA 01606
            USA
             Email: azekeria@fitchburgstate.edu

         Telephone Office (978) 665 - 3330   Fax (978) 665 - 4031
              Home (508) 856 - 0278

SUMMARY OF QUALIFICATIONS

EDUCATION:
Ph.D. in Mathematics: Howard University, Washington, D.C.
      Graduated December 1984.
Thesis Topic: "Singularly *Perturbed Second Order Differential Equation With*
      A Discontinuous Coefficient in Hilbert Space"
M.S. in Mathematics, University of Wyoming, Laramie Wyoming
      Graduated July 1977.
Plan- B Paper Topic: "Survey *of some Theorems of Metric Spaces*"

TEACHING EXPERIENCE:

September, 1987 - Present
Fitchburg State University
Fitchburg, Massachusetts
Position: Associate Professor

September, 1985 - 1987
California State University, San Bernardino
San Bernardino, California
Position: Assistant Professor

August 1978 - July 1985
Howard University, Washington D.C.
Positions: Graduate Assistant / Instructor / Lecturer

University of Asmara, Asmara Eritrea (Visiting)
 May 1994 – Dec 1994.
 March , 2002 – December 2002.

COURSES TAUGHT:

More than twenty five years of teaching mathematics at university level and graduate and undergraduate
COURSES TAUGHT INCLUDE: Basic Mathematics, Functions, Precalculus, Calculus I-IV, Differential
Equations, Calculus for Business and Liberal Arts, Business Statistics, Applied Statistics, Technical Calculus,
Discrete Mathematics, Applied Mathematics I -IV Operational Research, History of Mathematics, Linear Algebra,
Abstract Algebra.

I have used various mathematical models such as Inventory Problems for optimization. In addition, I have extensive experience in a number of pedagogical applications of technology such as DRIVE, MINITAB, SPSS, and MATLAB.

SCHOLASTIC ACTIVITIES:
Sabbatical Leave Fall 2011 Visiting Eritrea Institute of Technology, Mai - Nefhi , Eritrea
 College of Marine Biology and Technology, Massawa – Eritrea
AP Calculus Reader, Kansas City Summer 2011.
Developed and taught online course for Business Statistics for Fitchburg State University, Summer 2011
Attended many   Mathematical Joint Meetings as well as NTCM annual meetings..
Gave talks and seminars at Fitchburg State and Eritrea.
Publications: " Singularly Perturbed Boundary Value Problem with a Discontinuous Coefficient in a Hilbert Space.”
National Association of Mathematicians Proceeding, Phoenix, Arizona, January 14, 1989.
 “On Perturbation Problem" 6th Annual Graduate Students Symposium, Howard University, Washington D.C.

MEMBERSHIP: Past and present membership include

>   American Mathematical Society
>   Mathematical Association of America
>   National Association of Mathematicians
>   Association for Supervisors and Curriculum Development
>   National Council of Teachers of America
>   Union of African Mathematicians.

ANNE HAYES ANDERSON
28 Minuteman Road, Acton, MA 01720-3840
Phone: 978-635-0135 (home) 978-807-6435 (cell)
E-mail: anne.anderson@alum.swarthmore.edu

OBJECTIVE: a position teaching applied statistics or developmental algebra at the post-high school level.

EDUCATION

Professional Development Courses: MA DESE "Sheltered English Immersion Category 2 – [mathematics] Content Instruction for Limited English Proficient Students"; robotics for instruction in middle school and secondary science, technology, engineering, mathematics;supporting all learners.
Developing Algebraic Thinking, Grades 4-10, July 2008
MA DESE Professional Development Institute with 3 graduate credits through Regis College.
New Teachers Collaborative, Devens, MA, June 2008
Completed MA DESE-approved teacher preparation program.
MS, Computer Science, San Diego State University, 1986, GPA 3.8
Masters project on optimization of machine code; courses included multi-variable calculus, numerical analysis, discrete math.
BA, Sociology/Anthropology, Swarthmore College, 1975, National Merit Scholar
Courses included differential and integral calculus, linear algebra, mathematical statistics.

LICENSURE STATUS

Massachusetts Department of Elementary and Secondary Education Initial License
Mathematics: Grades 5-8 July 14, 2008; Grades 8-12, July 25, 2008; Certificate#419448. Have passed MTEL 09 Mathematics (high school level) and 01 Communication and Literacy Skills tests**.**

EMPLOYMENT

Fitchburg State College   September 2009 to present
Middlesex Community College   September 2009 to December 2009
Adjunct Instructor, Mathematics
  ● Have taught six sections of developmental algebra and six sections of applied statistics
  ● Emphasis on more effective student engagement during class time, teaching how to learn

Fitchburg Arts Academy Pilot Middle School   August 2008 to June 2009
6th-8th Grade Math Teacher (full-time)

  ● Full responsibility for mathematics instruction and assessment satisfying MA DESE frameworks.
  ● Used Connected Mathematics Program and Connected Mathematics Program 2 texts with supplementation
  ● Collaborated with 4 other subject-area teachers to provide several integrated projects.
  ● Worked with a variety of special needs, with occasional inclusion assistants.
  ● Mentored a 6th grade "advisory" group; provided after-school help one afternoon per week.

Francis W. Parker Charter Essential School   August 2007 to June 2008
7th-8th Grade Math Teacher (full-time)

- Full responsibility for mathematics instruction satisfying MA DESE frameworks.
- Collaborative curriculum development with other science and math teachers.
- Differentiated instruction (classes not tracked; contained mixture of 7th-9th grade students).
- Worked with a variety of special needs (no inclusion assistants).
- Frequent narrative assessments of each student's work.
- Helped mentor a small group of students with service projects, group development, and life at Parker. Voluntarily provided after-school help 2-3 days per week. Mentored a senior doing a computer science project. Voluntarily supervised a student-run after-school origami club.

Sun Microsystems Laboratories   1998 to August 2007

HIGHLIGHTS: Research on security and privacy technology for virtual business environments. Key developer of new access control language standard and its profiles as international standards; published and presented widely; gave invited keynote talk at international conference. Helped develop public key certificate modules for Java 1.4 release. Received top-level employee ratings.

Previous computer employment with:
- **Hewlett-Packard Company** [initially **Apollo Computer**]   1988 to 1998
- **Unisys Corporation** [initially **Burroughs Corp**.]   1982 to 1988
- **Infomark, Inc.**   1978 to 1982
- **Computer Sciences Corporation**   1976 to 1978
- **Logicon, Inc.**   1974 to 1976

Highlights: Security: developed public key infrastructure recommendations that major customer adopted; public key infrastructure consulting to multiple teams; technical lead for team that added security enhancements to major distributed computing platform. **Operating Systems**: Managed operating system team for mainframe computers; managed development of a distributed message-passing operating system for a new workstation, helped develop another. **Firmware and Networks**: Significantly improved memory capacity and network device drivers on two different platforms; led development of software for a CSMA/CD network, and of firmware for a fiber optic network board. **Compilers**: Specified, designed, and delivered a virtually maintenance-free SEQUEL (predecessor to SQL) relational database query language system, implemented all compiler components, wrote parser generator and database view converter; ported "Small C" compiler and wrote run-time library.

U.S. Patents: inventor on 11 U.S. Patents.

Peer-reviewed Publications: author of 8 peer-reviewed publications.

Other Publications: author of 11 OASIS/ITU-T and OSF/DCE standards.

Details of computer industry experience, patents, and publications available on request.

Shawn Case

47 Evans Circle ~ Templeton, MA 01468 ~ scase85@gmail.com ~ 978.895.0694

Qualifications and Capabilities

- In-depth undergraduate and graduate courses in mathematics including Multivariate Calculus, Differential Equations, Measure Theory and Numerical Analysis.
- Confident in research, analysis, writing, problem solving and presentation; especially delivering a message for a large audience to comprehend.
- Strong leader who is an extraordinary team player, particularly in analyzing and solving problems, and takes full responsibility and sense of ownership in all tasks at hand.
- Experience using Internet applications, Excel, Word, MatLab, Mathmatica, Maple, and PowerPoint for research, data collection, retrieval and analysis, writing, and presentation-focused projects.

Mathematics Education

University of Rhode Island | Kingston, RI   *2008-2010*

Masters in Mathematics
- GPA: 3.8
- Concentration: Applied Mathematics

Fitchburg State College | Fitchburg, MA   *2004-2008*

Bachelor of Science in Mathematics and English
- GPA: 3.56
- Math Concentration: Statistics and Applied Mathematics
- English Concentration: Theater

Professional Mathematics Presentations

Pielou's Equation

University of Rhode Island | Kingston, RI   *Spring 2009*
- Presented a power point presentation to professors and peers at the University of Rhode Island
- Illustrated the change in the activity of function by introducing a new variable using Difference Equations.

Dynamical System Theory: Sink or Source

Pi Mu Epsilon Conference | Madison, Wisconsin   *Spring 2008*

Hudson River Undergraduate Mathematics Conference | Canton, New York   *Spring 2008*
- Presented a power point presentation to an audience of prestigious mathematicians, professors, students and alumni.
- Used eigenvalues to plot and demonstrate a various assortment of vector fields.

Work Experience

Mathematics High School Teacher | Narragansett Regional High School | Templeton, MA   *January 2011-Present*
- Designed and implemented lesson plans for Geometry, Algebra and Trigonometry, and Integrated Math I
- Experience with classroom management of grades 9-12

Mathematics Instructor | Fitchburg State University | Fitchburg, MA   *September 2010-Present*
- Designed and implemented lessons in Basic Math II course
- Delivered abstract mathematical concepts to an assortment of diverse learners in a manner that allowed for comprehension and application
- Kept a fast paced schedule and met all deadlines while making sure students fulfilled their requirements
- Using internet resources to communicate mathematics and mathematical ideas via the world wide web

Mathematics Tutor | Fitchburg State College | Fitchburg, MA   *September 2005- Present*
- Relayed concepts in problem solving in a one on one and small group setting
- Summer Program Coordinator, responsible for preparing students to succeed on a math placement exam
- Recently starting working and gaining experience with students in Disability Services

Central Massachusetts High School Soccer Official   *September 2004- Present*
- Enforcer of rules and regulations through interactions with players, coaches, and parents

Awards and Achievements

- Teacher Assistantship | *University of Rhode Island*   *Fall 2008 – Spring 2010*
- Passed the Massachusetts Tests for Educator Licensure   *Spring 2010*
- Passed the Master Comprehensive Exams for Math Analysis and Linear Algebra   *Summer 2009*
- Magna Cum Laude | *Fitchburg State College*   *Spring 2008*
- Pi Mu Epsilon | **Mathematics Honor Society** | *Fitchburg State College*   *Fall 2006*
- Sigma Tau Delta | **English Honor Society** | *Fitchburg State College*   *Fall 2007*

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Education

San Francisco State University
BA Physics, 1984

College of Marin, Kentfield, CA.
AA Mathematics, 1981

Employment

Adjunct Math Faculty

Fitchburg State University/College   *September 1999 to Present*
160 Pearl Street, Fitchburg, MA

Taught Basic Math I (pre-Algebra), Basic Math II (Algebra), Functions (college algebra), and Pre-Calculus (college algebra plus trig). Additionally, I taught for the summer *Bridge Program* in 2001 and 2002. This is a special five-week program that enables disadvantaged High School graduates that have failed to meet the admission requirements enter FSC in the fall.

Mt. Wachusett Community College   *January 1999 to Present*
444 Green Street, Gardner, MA
& Leominster Campus, Leominster, MA

Taught day and evening sections of math from the developmental level through college math, including Basic Math, Algebra, Intermediate Algebra, Math for Allied Health, and College Algebra.

Academic Advisor

Mt. Wachusett Community College   *Summer 2000 to January 2011*
444 Green Street, Gardner, MA
& Leominster Campus, Leominster, MA

I assist the Enrollment Center and the Leominster campus with academic advising and registration of students on an as-needed basis prior to fall, spring and summer semesters, and at various other times as necessary.

Math Tutor

Mt. Wachusett Community College   *September 1998 to May 2002*
444 Green Street, Gardner, MA

As a Professional Tutor for the *Visions Program*, a federally funded TRIO program, I worked with many non-traditional students such as re-entry students and students with learning disabilities. As a tutor in the Math Lab, I instructed students from the general school population on a drop-in basis.

Fitchburg State College   *September 1999 to June 2000*
160 Pearl Street, Fitchburg, MA

Tutored students for *Expanding Horizons*, a program similar to the *Visions Program* at MWCC, from a similarly disadvantaged student population.

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Technical Writer and Online Documentation Engineer

JYACC, Inc.   *November 1993 to January 1998*
55 William Street Wellesley, MA

I produced online documentation for *Prolifics* (formerly *JAM*), a software tool for building applications. The online documentation used the *Dyna*Text system for viewing published electronic books. This process required writing a program to convert files from the *Interleaf* desktop publishing system into SGML formatted files, and then building electronic books from these SGML files using *Dyna*Text. I also wrote various parts of the documentation.

Software Engineer

VI Corporation   *May 1991 to June 1993*
47 Pleasant Street Northampton, MA 01060

As a member of a four-person team I contributed to the design and development of the Graph Widgets product, an Xt-based widget library providing user configurability for dynamically displaying data, which was eventually marketed under the name *DynaGraphX*. I assisted in incorporating the graph widget set into *XDesigner*, a Motif GUI builder, and also designed and implemented configurable fonts and user-feedback features for the second release of the product.

Island Graphics   *January 1990 to April 1991*
Larkspur, CA

As an engineer in the Office Products division I worked on the *Write, Paint & Draw* programs that comprised Island's X Windows-based desktop publishing system:
* Designed and developed a filter for converting Lotus 123 binary spreadsheet files into native Island format for importing into *Island Write*.
* Designed and developed a filter for converting Microsoft Word RTF files to native Island format for importing into *Island Write*.
* Designed and developed a Motif interface for the installation program.

Software Engineer/Programmer

The Fair, Isaac Companies   *May 1984 to December 1989*
120 N. Redwood Blvd. San Rafael, CA

Developed software for turn-key automated credit scoring ("FICO score") computer systems. I was responsible for implementing enhancements to existing systems and to the core software. Additionally, I had sole responsibility for one client — tasks included system fire-fighting and producing or updating specs and software changes resulting from client requests or baseline changes to the core software.

References available on request

ERIC N CHRISTENSEN
272A Sanborn Road
Tilton, NH 03276
Ph. 508-414-6850
Email: ericchrs@gmail.com

QUALIFICATIONS

A veteran professional educator with over 25 years experience as a full-time teacher, mostly at the high school level. I have always been a student-centered teacher who has consistently supported and encouraged young people both inside and outside of the classroom.   I am greatly honored to have received three high school yearbook dedications and was invited by the Moultonborough (NH) Academy Class of 1996 to be their commencement speaker.

I also have had a well-rounded variety of related experiences. I was a coach for many seasons of numerous athletic teams and I also served as an athletic director, a summer school coordinator and an adult education director. In addition, I have many years of experience as a mathematics curriculum coordinator.

I was previously an adjunct faculty member for the New Hampshire Community College system and at Southern New Hampshire University. I also taught both full-time and part-time at Bentley University in Waltham, MA.

EDUCATION

Master of Education, Mathematics, Plymouth (NH) State University.

Master of Arts in Teaching, Secondary Education, University of Massachusetts
        (Amherst).

Bachelor of Arts, Government, University of Massachusetts, Amherst.

EMPLOYMENT

2009 to present.   Adjunct Math Instructor, Fitchburg State College.

2008-2009. Adjunct Math Instructor, Bentley University.

Summer, 2008 and 2009. Taught summer school Geometry and Algebra 2, Southbridge, MA.

2004 to 2007. Math Teacher, Prospect Mountain High School, Alton, NH.
Taught Algebra 1, Algebra 2, and Pre-calculus classes.   Math Curriculum Coordinator and member of Freshman Academy Team. Attended NCTM National Conference in St. Louis, April, 2006.

2002-2004. Mathematics Instructor, Bentley College, Waltham, MA.
Taught first-year Applied Calculus courses at this private business college.   Math Tutor, Pinnacle Learning Center, Canton, MA.

2000-2001. Math Teacher, Alton (NH) Central School.
High School Geometry and Algebra 2.

1996-1999. Math Teacher, Conant High School, Jaffrey, NH.
Taught Algebra 1, Geometry, Trigonometry, and Statistics courses. Served on the District Educational Improvement Plan's Steering Committee. Participated in summer grant projects to develop new Integrated Math courses and align the math curriculum with the state and national standards. Attended national ASCD Conferences on Assessment and the Curriculum in Orlando and San Antonio.

1983-1995. Math Teacher, Moultonborough Academy, Moultonborough, NH.
Taught the full range of high school math courses.
Attended numerous state, regional and national conferences and workshops sponsored by the National Council of Teachers of Mathematics. Received a state grant to develop and implement a Gifted and Talented pilot program for the junior high school. Selected to participate in the Governor's Initiatives, Gifted and Talented Summer Program.

RONALD F, LANGE
37 Cumberland Road
Leominster, MA 01453
Phone: 978-537-6046

OBJECTIVE: Career as college instructor

SUMMARY:

Previously, Research and Senior Research Chemist with the chemical industry. Taught
college, high school, and grade school during career change. More recently, phone
representative for 4O1(k) and stock plan investments.

SPECIAL SKILLS:

- Well-organized person
- Quick thinking and positive individual
- Distinctive voice
- Excellent verbal communicator and writer
- Effective problem solver

SIGNIFICANT ACCOMPLISHMENTS:

2000 -   Part time mathematics instructor - basic mathematics, introductory
             algebra, intermediate algebra, and functions up to calculus - Fitchburg
             State College, Fitchburg, MA, and Mount Wachusett Community College,
             Gardner, MA

1996 - 1998 Part time inorganic chemistry and mathematics instructor - college
             courses as approved by Fitchburg State College to industrial employees
             for accreditation via evening sessions to include discussions of text topics
             and supervision of chemistry laboratory experiments - ChemDesign
             Corporation, Fitchburg, MA

1980 - 1981 Full time chemistry professor - organic and inorganic chemistry to
             include lectures on text topics and laboratory experiments - Fitchburg
             State College, Fitchburg, MA

1978 - 1980; Full time and part time substitute teacher in French and all other subjects,
1981 - 1987 respectively, and mathematics tutor up to calculus at local Montechusett
             area high and grade schools

OTHER EMPLOYMENT HISTORY:

1995 - 1999 Telephone customer service representative for:

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OTHER EMPLOYMENT HISTORY (CONTINUED):

Fleet-managed 401(k) Plans - First Data Corporation, Westborough, MA

Employee Stock Purchase and Restricted Stock Plans - Digital Equipment Corporation, Maynard, MA

General Motors' 401(k) Plans - Fidelity Investments, Marlboro, MA

Shawmut 401(k) Plan - Shawmut Bank, Boston, MA

1988 - 1995 Customer Service Supervisor and Telephone Representative - Supervised full time and temporary personnel to answer customer calls and assist walk-in customers with their 401(k) and stock purchase plans - Digital Equipment Corporation, Maynard, MA

1987 - 1988 Data Entry Specialist - Typed and proof read articles about competitors' related activities for company distribution - Digital Equipment Corporation, Maynard, MA

Up to 1978 Senior Research Chemist - Defined transfer printing technology for textiles on manufacturing scale - Decotone (Division of Litton Industries), Westminster, MA

Research Chemist - Conducted several long-term basic product and process development research projects on textiles, polymers, dyestuffs, additives, etc., in the laboratory and large scale internal efforts on a defined textile for commercialization in Europe and the U. S. Obtained five patents and the product from one was marketed - DuPont, Wilmington, DE

EDUCATION:

PhD Organic Chemistry   -   University of Minnesota, Minneapolis, MN

B. S. Chemistry & Mathematics   -   University of Illinois, Urbana, IL

Computer Courses   -   Fitchburg State College, Fitchburg, MA

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Robert A. La Vergne
20 South Meadow Road
Lancaster, MA 01523
978-368-7704
robertlavergne@mac.com

Objective

To teach critical thinking skills via math' and physics

Education

1994-1997	University of MA/Lowell/MSc Mathematics
1988	SUNY/Albany/BA Economics
1982-1987	University of MA/Lowell/Mathematics/Mech. Eng. (focus upon thermodynamics, heat transfer, compressible and incompressible fluid dynamics)
1977-1980	University of Massachusetts/Amherst /Mech. Eng./Economics

Work Experience

2002-11   Fitchburg State University - Adjunct Math Instructor

2008   Broomfield Labs - Electro-mechanical assembly of large capacity
coil winding machines. Read/interpreted blue prints, operation of
machine tools and equipment, conducted tests and analysis of mechanical,
electrical, and pneumatic components.

1986-2002   Teaching -

Fitchburg State College - Full-time Math instructor
Algebra, Pre-Calculus, Calculus & Statistics
Worcester Polytechnic Institute - Adjunct Instructor
Calculus
Worcester Vocational High School - Math Instructor
Nashoba Regional H.S. - Math/Science Substitute

References

Tom Broomfield, owner/Broomfield Labs, 978-779-0032
Mary Ann Barbato, math dept. head, FSU, 978-665-3211, msaadi@fitchburgstate.edu
Gerald Higdon, math dept. head (2000-2002), FSU, 978-665-3271, ghigdon@fitchburgstate.edu
Homer Walker, math dept. head, WPI, 508-831-5496

Lori L. Leonard
1130 Wachusett Street
Jefferson, MA 01522
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EDUCATION

Nova Southeastern University

A.B.D. Computing Technology in Education
Ed.S (Educational Specialist)
Degree Awarded: December 1998
School of Computer and Information Sciences
Major: Computing Technology in Education

Northeastern University

Masters of Science in Computer Science
Degree Awarded: September 1988
Concentration in Artificial Intelligence

Worcester State College

Bachelor of Science
Major: Double Major Computer Science and Mathematics
Degree Awarded: May 1986
Honors: Cum Laude

Quinsigamond Community College

Two Associates in Science
Major: Business Administration, Business Data Processing
Degrees Awarded: May 1984
Honors: Graduated with Highest Honors
Who's Who in Junior Colleges 1984
Outstanding Data Processing Student 1984

ACADEMIC WORK EXPERIENCE

Assumption College
Since January 2009
Adjunct Faculty MBA program and Continue Education

Nichols College
Since January 2005
Visiting Assistant Professor (Jan-May 2005, 2006)/Adjunct Faculty
Mathematics and Management Information Systems Departments

September 1989 - 1998
Adjunct Faculty Management Information Systems Department

Fitchburg State College
Since September 2000
Instructor Computer Science Department (Sept. 2000-May 2004) *and Adjunct Faculty Computer Science and Business Administration Departments (Assistant Professor)*
Committees
- Academics Policy Committee
- Computer Information Systems Accreditation Committee: Chair
- Computer Information Systems Curriculum Committee: Chair
- Computer Science Advisory Committee

Quinsigamond Community College
Since September 1988
Adjunct Faculty Computer Information Systems and Mathematics

Additional employment held at QCC:
Academic Advising (1989-approx 2000)
- Assist the Director of Academic Advising
- Duties: Scheduling of Advisors, Administrating the Computerized Assessment Testing Program, advising students with course selection, relay the colleges academic policies and procedures to students, disseminate admissions and career information, provide academic counseling to students.
Staff Development
- Train staff, faculty, and administrators on the use of Microcomputers, and software packages.

CO-OP Faculty Supervisor for Day and Evening Students.

Evening Administrator (1990-1997)
- In charge of all evening classes and the college campus.

Alternate Chief Examiner, GED Program
- Duties: administration and proctoring of the GED exams.

Committees

- Academic Advising Advisory Committee
- Computerized Placement Testing (CPTS) Advisory Committee
- Computer Information Systems Advisory Committee
- Enrollment Services Task Force

Becker College
Since September 2009, September 1995 -1999,
Adjunct Faculty Computer Science Department

Newbury College
September 1999- August 2000
Director of Computer Science/Full-time Faculty

Worcester State College
Temporary Full-time Instructor Computer Science and Mathematics Department (January 1998 – May 1999)

Adjunct Faculty Computer Science and Mathematics Department, Day and Evening *(January 1990 –May 2003)*

Clark University
September 1990-2000
Adjunct Faculty Department of Mathematics and Computer Science
Instructor College of Professional and Continuing Education (COPACE) January 1990 - July 1992
Adjunct Faculty Graduate School of Management (GMOS) September 1993 - January 1994

Worcester Polytechnic Institute
1989 - 1992
Guest Faculty Computer Science Department

Wentworth Institute of Technology
January 1989 - May 1990
Instructor Continuing Education Math and Computer Science Department

Professional Memberships

ACM
IEEE

COURSES TAUGHT

Mathematics Courses
- Beginning, and Intermediate Algebra, College Algebra, Problem Solving with Algebra,
- Basic Mathematics, Math Review (developmental)
- College Math
- Pre-calculus
  - Statistics (Undergrad and Graduate), Statistics for Economics, Computer-aided Statistics,
  - Statistical Analysis and Mathematical Analysis
- Computer Mathematics & Logic Systems
- Discrete Math

Programming languages
- C and C++ Programming Language, Introduction and Advanced
- Visual C++
- Cobol, Introduction and Advanced
- Java, Introduction and Advanced
- Other languages: Fortran, RPG

Computer Science / Computer Information Theory Courses
- Introduction to Computer Information Systems
- Database Management (also Graduate Level Clark University)
- Data Communications and Networking
- Data Structures

- Digital Computer Organization
- Introduction to Computers
- Local Area Networks
- Introduction to MIS (Management Information Systems)
- Operating Systems
- Systems Analysis and Design

Microcomputer Application Software
- Microsoft Office –Word, Excel, Access, PowerPoint
- Windows Operating Systems

Web Design & Internet
- Internet Communications
- Basic Web Design (HTML)
- Advance Web Design with JavaScript
- Advance Topics in Web Development: including Flash

Business Courses
- Introduction to Management
- Statistics for Economics
- Introduction to MIS (Management Information Systems)

Michael Stassen
893 Main St.
Leominster, MA 01453
(978) 466-6253
e-mail: mstassen@fitchburgstate.edu

Education

M.A. Mathematics, Indiana University, December 1990
B.A. Mathematics, Earlham College, 1987

Teaching Experience

Lecturer, Mathematics Department/ GCE, Fitchburg State University

Basic Math I (MATH 0100): 2 sections, Fall 2004
Basic Math II (MATH 0200): 15 sections, Spring 2005 - Fall 2011
Introduction to Functions (MATH 1250): 12 sections, Spring 2004 - Spring 2010
Pre-Calculus (MATH 1300): 10 sections, Spring 2003 - Spring 2011
Applied Statistics I (MATH 1700): 20 sections, Summer II 2003 - Fall 2011
Business Statistics (MATH 1800): 5 sections, Fall 2006 - Spring 2011
Business Calculus (MATH 2200): 4 sections, Spring 2006 – Spring 2009
Calculus I (MATH 2300): 5 sections, Spring 2004 - Summer I 2011
Calculus II (MATH 2400): 2 sections, Fall 2004

Associate Instructor, Department of Mathematics, Indiana University

Basic Algebra (M014) - Fall 1990
Calculus II (M216) - Spring 1990
Calculus I (M215) - Fall 1989
Finite Mathematics (M118) - Summer 1989
Brief Survey of Calculus I (M119) - Fall 1988, Spring 1989

Associated responsibilities:
Lecturer: M014, M215, M216
Office hours: M014, M119, M215, M216
Design exam questions: M014
Design course workbook: M118
Grading: M014, M119, M215, M216

Tutor, Mathematics and Computer Science Departments, Earlham College
Individual and drop-in tutoring, 1983-1987

Honors and Awards

Graduate Fellowship, Indiana University 1988-1990

Research Experience

Research Technician, Department of Psychology, Indiana University, 1991-1995.
Supervisor, Dr. Geoffrey Bingham

Other Experience

System Administrator/Programmer, University Information Technology Services
Indiana University, 1998-2002
Maintained Support Center production servers and programs, including the
Indiana University Knowledge Base <http://kb.indiana.edu>.

Online Support Coordinator, University Information Technology Services
Indiana University, 1996-1998
Managed team providing customer support by e-mail.

Front Line Consultant, University Information Technology Services
Indiana University, 1995-1996
Provided customer support via phone and e-mail to faculty, staff, and students.

Publications

Bingham, G. P., Romack, J. L., & Stassen, M. G. (1993). Optical information in visually
guided reaching with perturbation of visual direction. In S. Valenti & J. B. Pittenger
(Eds.), *Studies in Perception and Action*, Vancouver, Ontario, Canada.

Bingham, G. P., Romack, J. L., & Stassen, M. G. (1993). Targeted reaching with
perturbation of visual direction. In *18th Interdisciplinary Conference*, Jackson Hole,
Wyoming.

Bingham, G.P. & Stassen, M.G. (1994). Monocular egocentric distance information
generated by head movement. *Ecological Psychology*, 6(3), 219-238.

Kenneth A. Takvorian   10/16/11

191 Peninsula Drive
Lunenburg, Massachusetts 01462

Home Phone: 978-582-7725
Work Phone: 978-630-9232
E-mail: ktakvorian@mwcc.mass.edu

EMPLOYMENT HISTORY

1970-Present

Professor of Electronics and Mathematics, Mount Wachusett Community College

Aspire Training for Redesign of Developmental Math Courses 6/2011-present
Designed/Implemented Math Lab with Two Self-Paced Instruction Courses 2008-present
Co-Chair Developmental Math Education Course Implementation 2008-2009
Tablet PC Initiative 2006-2007
HP Wireless Tablet PC Grant 2007-2009
Courses in Electronic Technology and Mathematics
Developed/Teaching Five Distance Learning Courses from Basic College Math thru Intermediate
Algebra 2003-2011
Planned Curriculum in Electronics and Mathematics
Developed Courses in Digital Electronics/Intermediate Mathematics

1999-Present

Adjunct Instructor, Fitchburg State College
Courses: Summer Bridge Program sum00-sum11
         Basic Mathematics II
         Functions:sum02,f02,sp03,sum03
         Pre-Calculus:sum02

1987-2004

Enrollment Services Advisor, Mount Wachusett Community College
Assists students in career planning, course selection and scheduling of courses
Reviews academic student credentials
Trained in Banner registration

1998-2004

Instructor, Electronics Tech Program for Simplex Time Recorder
Designed/Implemented test for selection of personnel into two year Tech Program
Developed/Taught classes in Algebra for Technology, D.C. Circuits, Digital Technology

EDUCATION

1970

Lowell Technological Institute (University of Massachusetts-Lowell),
1965

M.S., Mathematics
Lowell Technological Institute (University of Massachusetts-Lowell),B.S., Electrical Engineering

PROFESSIONAL ASSOCIATIONS

New England Mathematics Association for Two Year Colleges

- At large Director 2011-2013

American Mathematical Association for Two Year Colleges

Higher Education Council for National Education Association

- MYMATHLAB Faculty Advocate   2008-present

WORKSHOP PRESENTATIONS

- Invited to the **Houghton Mifflin Boston Headquarters**—December 2006
  Interviewed/ videotaped my experiences using Eduspace in the classroom for greater student   success. Tape presented at their national sales meeting .
- Presentation at the **19ᵗʰ Annual International Conference on Technology In Collegiate Mathematics**—February 2007 Boston
  Using MYMATHLAB for Student Success in Teaching Developmental Math
- *Course Management Systems—A Tool for Student Success—**MTA Summer Conference**, August 2006*
- Intermediate Algebra on-line with MYMATHLAB—**10ᵗʰ Annual MCC Conference on Teaching, Learning and Student Development** –April 2007
- A key to Success in Developmental Math—**Mass College On-Line Conference** –June 2007
- Clickers-Engaging/ Motivating Students while Learning---**MTA Summer Conference**—August 2007
- Clickers-Engaging/ Motivating Students while Learning—**College Board Conference** ---October 2007
- Student Success and Encouragement—**E-Learning Conference**, June 2006
- *Eduspace- An overview of a Course Development System for Math—**Lunch/Learn Workshop for Math Faculty—April 2006***
- *Overview of Three Course Management Systems—**E-Learning Conference**, June 2005*

PROFESSIONAL CONFERENCES

- *Annual Meeting American Mathematical Association for Two Year Colleges*
- *Annual Meeting New England Mathematical Association for Two Year Colleges*
- *Delegate, Annual Meeting National Education Association*
- *Delegate, Annual Meeting Massachusetts Teachers Association*
- *Delegate, Annual Meeting Massachusetts Community Colleges*

OTHER ACCOMPLISHMENTS

Sabbatical—Develop Math Distance Learning Materials/Courses –Spring 2005

Sabbatical – Using Software to Create Electronic Lab Projects and Workshops – Spring 1997

Director, Hickory Hills Landowners, Inc. since 1982-2007

Travel Consultant, Craine/Calmark Travel Service since 1982

Electronic Olympics for area high schools – 1996, 1995

Reviewer of the following textbooks:

> *Intermediate Algebra, 9th edition, Addison-Wesley Publishers*

> *Introductory Algebra, 6th edition, Houghton-Mifflin Publishers*

Recent Conferences/Workshops   Presented /Attended

8/08, 8/09, 8/10, 8/11 Test Your Trivia Knowledge via Clicker Response System- MTA Summer Conference at Williams College

July 2011   Class Test Sample Chapter for a new text book-   Pearson Ed

8/6 & 9/07   MTA Summer Conference--Williams College
                    Clickers-Engaging/Motivating Students while Learning

Fall 2007   Class Test Sample Chapter for a new text book-   Pearson Ed

10/1/07 MCCC Fall Leadership Conference--Worcester

10/19/07 College Board Conference—Worcester
                    Clickers-Engaging/Motivating Students while Learning

11/1-4/07   AMATYC—Math Conference—Minneapolis

Spring 2008 Class tested a new text/software for the semester--   Pearson Ed

3/2-5/08 TASS-Teaching Academic Survival Skills—West Palm Beach
                    A Tool for Success—MYMATHLAB or EDUSPACE

3/6-9/08 ICTCM--International Conference on Technology in   Collegiate Math—
San Antonio
                    Engaging/Motivating Students while Learning

4/11/08 11th Annual Teaching/Student Development Conference--
                    North Shore CC
                    Click Your Way to More Engaged Classes

4/12/08 NEMATYC Math Conference—Springfield Tech CC
                    Click Your Way to a More Engaged Classroom

5/21/08 Clickerfest—Fitchburg State College
                    Panel Discussion on How Clickers are used in Various Courses

6/10-11/08   Mass Colleges Online Conference—Middlesex CC
                    Engaging Communication—Classroom Presenter or Microsoft Journal

7/1-6/08 NEA Annual Meeting—Washington , DC

8/4-7/08 MTA Summer Conference--Williams College
Using Personal Response Systems to Enhance Learning

Fall/Spring
2007/2008   HP Grant—Engaging Classes thru Wireless Tablet
Technology

11/1-4/08   AMATYC—Math Conference—D.C.
Click Your Way to More Engaged Classes

3/12-15/09   ICTCM--International Conference on Technology in   Collegiate
Math—New Orleans
Tablets and CP3

Thomas N. Weiderman

5 Center St.
Ashburnham, MA 01430
(978) 827- 3335(h)
(978) 549-7244 (c)
tommy1122@msn.com

QUALIFICATIONS

Commonwealth of Massachusetts Certified Grades 9 – 12 Mathematics #318168

I have over 19 years of public school teaching experience at the elementary, middle and high school levels. I have also been an adjunct mathematics instructor at both Mount Wachusett Community College and Fitchburg State College for over five years. I also have seven years experience as a seasonal mathematics instructor at both private and international schools.

I am an enthusiastic and caring mathematics educator who believes that all students can be successful learners. I enforce a positive learning environment and have very high learner expectations. I have the ability to relate to students of all levels and interests, and demonstrate both traditional and current teaching practices and classroom management techniques. I posses a high level of knowledge in mathematics, on-line and distance learning, NEASC, MCAS, and other related topics.

PERSONAL PHILOSOPHY

~Mathematics is important, you can do it – I will not give up on you~

EDUCATION

2001   MAT Mathematics, Fitchburg State College, Fitchburg, MA
1983   B.A. Mathematics/Education, State University College at Potsdam, Potsdam, NY (Double Major)

EMPLOYMENT (Massachusetts)

2003 – Present   Mathematics Teacher, Gardner High School, Gardner MA
1996 – 2003   Mathematics Teacher, North Middlesex Regional High School, Townsend MA
1995 – 1996   Mathematics Teacher, Ayer Middle School, Ayer MA
1994 – 1995   Mathematics Teacher, Maynard Middle School, Maynard MA

2005 – Present   Adjunct Mathematics Instructor, Fitchburg State College, Fitchburg, MA
2006 – Present   Adjunct Mathematics Instructor, Mount Wachusett Community College, Leominster, MA

Summers 1999 – 2005   Mathematics Teacher, Cushing Academy, Ashburnham, MA
Summers 1993 and 1994   Mathematics Teacher, The Carol School, Lincoln, MA (5th Grade Math)

OTHER EMPLOYMENT EXPERIENCES

New York State Three years of teaching mathematics at grades 7 – 12 (1984 – 1986)
YMCA   Seven years of teaching, directing, and coordinating aquatic and camping activities. (1987 – 1994)
MILITARY   Four years in U.S. Army, primary duty as a foreign weapons instructor (1974 – 1978)

ACTIVITIES, ACCOMPLISHMENTS, AND ACHIEVEMENTS

- Teaching Web based hybrid mathematics courses at MWCC and FSC

- NEASC Steering Committee Member (5 years) – one of the seven members of the GHS Steering Committee
- Math Team Advisor and Coach (7 years) – advised and coached the GHS Math Team for seven years
- Drama Coach (2 years) – directed two full-scale musical plays at the high school level
- Wrestling Coach (2 years) – qualified one high school wrestler for the state tournament
- Class Advisor (1 year) – freshman class advisor
- Swim Team Coach (4 years) – YMCA age-group swimmers age 5 – 15
- Camp Director (4 years) – YMCA summer day camp director for 100+ campers on 15+ acre facility
- EMT (5 yrs) – a New Hampshire and nationally certified emergency medical technician

PRIMARY REFERENCES

Donna Pierce – Principal Gardner High School (978) 630 - 1600

Mitch Aho - Assistant Principal Gardner High School (978) 630 - 1600

OTHER REFERENCES (Phone numbers provided Upon Request)

Peggy McLaughlin – Instructor Coordinator/Mount Wachusett Community College Leominster Campus

Ken Takvorian – Mathematics Professor /Mount Wachusett Community College

RESOURCES APPENDIX

This section lists resources for the Mathematics Department. In particular, the budget, library holdings, technology, space and other materials are listed below in their own sections.

1.   <u>**Operating Budget**</u>

A table of the AY 2011-2012 Mathematics Department budget is listed below:

Administrative Expenses	$3001
Operational Supplies	$450
Honorariums	$200
Operational Services (Chartwells)	$100
Math Contest	$4000
Travel Funds	$2000
Department Software and Hardware expenses	$1110
Software Licenses and Maintenance (cost covered by the IT dept.)	$15,404
Special Projects Grants	$5740
Continuing Scholarship Funds*	$6820
Recruitment (Advertising and Candidate Costs)	$0
Total	$26265

*This amount is based on $682 per full time faculty member. If not all faculty members applied, then the remaining funds will equally distributed among those that did apply.

Academic Affairs centrally covers additional operational costs for departmental basic supplies, printing, copying, postage and phones, and faculty recruitment costs. The software license costs are covered by the Informational Technology Department.

In addition, all expenses (excluding full-time faculty salaries) are included for AY2008-2009 through AY 2011-2012 in the table on the next page.   The AY2011-2012 Mathematics budget is listed on the page after that.

Mathematics	AY2008-2009	AY2009-2010	AY2010-2011	AY2011-2012	Comments
Salaries Faculty	$705,229.14	654,698.63	$662,749.93	699,981.34	Full-time faculty
Salaries Staff	$41,730.00	$41,730.00	$41,730.00	$43,411.68	(1) 10-month secretary
Fringe Benefits & Payroll Tax	$192,790.15	$193,607.16	$237,621.08	$259,592.84	
Adjunct Salaries-Day	$86,440	$129,616	$159,374	$95,280	Fall and Spring PT day faculty
Operating Budget	$4,995.00	$3,673.00	$4,217.00	$4,861.00	
Elizabeth Haskins Mathematics Contest	$3,980.00	$3,601.00	$4,050.00	$4,000.00	
	$8,975.00	**$7,274.00**	**$8,267.00**	**$8,861.00**	
Software Licenses & Maintenance	$9,192.00	$12,048	$14,904	$15,404	Software licenses maintained by the University.
Department Travel Funds	$4,000.00	$2,000.00	$2,000.00	$2,000.00	FY09 allocated at $400 per faculty member. FY10, FY11, FY12 allocated at $200 per faculty member. Distributed at the discretion of the department chair.
New Faculty Professional Develop Funds	$800.00	$400.00	$0	$0	Support for new faculty hires, 1st yr. $800, 2nd yr. $400.
Special Project Grants			$1,300.00	$5740	Supports faculty and student projects. FY11 received 2 awards. FY12 received 5 awards.
Continuing Scholarship Funds	$7,680.00	$6,039.00	$6,101.52	$6820	FY12 per faculty amount $682. Any funds not applied for are equally distributed to those who applied.
Recruitment-Candidate	$446.00	$0	$1,115.00	$0	Reimbursements for faculty candidate travel expenses. FY09 searches suspended due to budget reductions.
Recruitment-Advertising Costs	$2,901.00	$0	$2,450.00	$0	University advertises in the Chronicle & dept. specific website/journal.
Postage - FSU Post Office					Paid by Central Services.
Copying Costs, FSU Press					Paid by Central Services.
Departmental Copier					Paid by Central Services.
Telephone					Paid by Central Services.

FY12 Base Budget Proposal

Department: Mathematics   **Department Head:**

Fund: T65   **Organization:** 1300   **Program:** 0000

					Operating Budget	Total
B00 – Regular Employee Related – Travel						
Travel funds are budgeted under AA and transferred to department budgets.						
					B00 Total:	
E00 – Administrative Expenses						
E01 - Office Supplies (based on fall 2010 expenditures and spring 2011 expected expenditures)					$	1,000
E02-GA Blanco based on fall 2010 expend & spring 2011 expected expend-plus toner					$	900
for Edgerly 106 which became a new expense for us in Fall 2010						
E02FS2 print services for fall 2011 and spring 2012					$	100
E12 - COMAP $312, Math Horizons $500, Chronicle $82.50 available online through Library, Magna (The Teaching Professor) $89					$	901
E14 - honors convocation plaques and book					$	100
E19 - Fees/Services = $295.00 (EIMS Ad for hiring)					$	-
					E00 Total: $	**3,001**
F00 – Facility Operational Supplies						
F16 - Teaching Material					$	450
(based on fall 2010 expenditures and spring 2011 expected expenditures, including AMC Exam -$138)						
					F00 Total: $	**450**
H00 – Consultant Services						
H15 - Speakers for fall 2011 and spring 2012					$	200
					$	-
					H00 Total: $	**200**
J00 – Operational Services						
Chartwells for departmental events in Fall 2011 and Spring 2012					$	100
					$	-
					J00 Total: $	**100**
K00 – Equipment Purchases						
K03 - Facility Equipment					$	-
K05 -Office Equipment					$	-
					K00 Total: $	**-**
L00 – Equipment Lease and Rental , Maint and Repair						
					L00 Total: $	**-**
U00 – Information Technology Expenses						
U03 - Software (for new applied math track, plus updated version of MathType)					$	200
U07 - IT Equipment (writing tablet $300, portable document camera $610)					$	910
					U00 Total: $	**1,110**
				Mathematics Operating Budget "0000" Total:	**$**	**4,861**

Fund: T65   **Organization:** 1300   **Program:** 1301

		Mathematics Contest	Total
E00 – Administrative Expenses			
E14 - plaques/awards for the Mathematics Contest, based on FY10 expenditures.		$	500
J00 – Operational Services			
J56 - Lunch - Mathematics Contest, $4,000 based on FY10 expenditures		$	3,500
Mathematics Contest "1301" Total:		**$**	**4,000**

0000	$	4,861
1301	$	4,000
Mathematics Department Total:	**$**	**8,861**

2. <u>Library</u>

The following section gives a summary of the library collection and services provided to the Mathematics Department, its faculty, its students and other students. There is a summary of the cataloged books, journals, and other electronic resources provided. The material in this section is based on the Library Director's Report in Appendix 5.1.

Department Liaison

The Mathematics Department works with Nancy Turnbull, a reference librarian on all mathematically related holdings.

Reference Collection

There are approximately 17 print volumes in the collection and there is access to 3 electronic reference titles. The collection continues to be mostly one-volume dictionaries, encyclopedias and books of tables. The reference collection has undergone a few changes recently. Some of the reference books have been transferred to the general collection. This would include *Women of Mathematics* and a few books dealing with mathematical tables. This was done to allow for circulation of the items and to free up shelf space.

Cataloged books (currently housed in the Hammond Library)

Mathematics in General	781
Miscellaneous	148
Elementary Mathematics	265
Algebra	475
Probabilities	108
Mathematical Statistics	215
Numerical Analysis	34
Mathematical Analysis	386
Geometry	333
Analytic Mechanics	67
Total	**2812**

In addition, the library holds 1,556 and 1,218 monographs in the related fields of Computer Science and Physics.

Series/Journals

The library receives individual subscriptions to journals in print and electronic format. The library also has access to electronic journals in various aggregator databases. The journal locator service, *Serials Solutions*, identifies journals the library owns and/or has available in full-text databases. The service provides links to our catalog holdings information and to specific databases. There is access to 475 titles in Mathematics. The reference *Magazines for Libraries (2011 ed.)*

recommends 32 titles and the Library has access to or receives in print format 22 of the titles or 69%. Beginning in January 2012, the Library will have access to *JSTOR IV-IX* and this will add access to approximately 45-50 additional titles.

Number of journals by sub-discipline
- Algebra (40)
- Calculus (19)
- Elementary Mathematics & Arithmetic (8)
- Geometry (17)
- Mathematical Statistics (62)
- Mathematical Theory (144)
- Mathematics - General (158)
- Mathematics Teaching & Research (27)

The collection also receives the annual publication *Yearbook of the National Council of Teachers of Mathematics.*

Electronic Resources

The library has access to 16 relevant databases (details can be found in the report below) and most importantly, a *MathSciNet* subscription was obtained in 2008. Data shows that there is healthy usage of this database.

Library Services

Library Instruction

The Library Instruction services offered by the Librarians are available to all classes, the graduate and undergraduate programs, and to on and off campus courses. The librarians work with the faculty to design handouts, exercises, projects, which will enable students to become effective library researchers in their discipline. A library Instruction classroom is located on the 3rd floor of the Library and contains 30 student workstations, one instruction workstation, an overhead projector, and an electronic white board. In order to provide flexibility and offer instruction classes in other classroom buildings and off-site, additional equipment includes a portable lap-top computer, a portable screen and a portable projector.   Three mathematics classes have taken advantage of this service recently.

Research Guides

The library provides discipline-based online research guides for Mathematics and there are two course specific online research guides http://fitchburgstate.libguides.com/cat.php?cid=480

Geometry Displays

Two mathematics professors have their students in their Informal Geometry courses create various physical projects to illustrate special relationships, lines, etc. and these are put on display in the Library.

3. <u>Space</u>

Classrooms

Mathematics classes recently have been held across campus in Thompson Hall, Edgerly Hall, Percival Hall, Conlon Industrial Arts, Condike and McKay. These classrooms hold between 25 and 45 students each and all have either a blackboard or whiteboard.   There are a few blackboards in Condike Science in which the blackboard is nearly impossible to read from. Nearly all of the rooms have tier 1 media capabilities (computer, VCR/DVD and projector) with laptop hookup available. In addition, many of the rooms that mathematics faculty request contain SmartBoards. Many of the classrooms with a Smartboard have an insufficient amount of additional whiteboard space. In addition, since the actual SmartBoard is also where the projected image is shown, if the Smartboard is not being used, the resulting projected image is usually too small to be seen throughout the classroom. In short, in these classrooms, if the SmartBoard is not being used, then compromises are made.

Faculty and Departmental Offices

The Mathematics Department is located on the third floor of Edgerly Hall. The following is a listing of all the space (except for classrooms) used by the Department.

- Full-time Faculty Offices: 301A, 301B, 301C, 301D, 301E, 301F, 301G, 301H, 307, 310A (chair's office)
- Adjunct Faculty Offices: 301I, 301J (for four adjunct faculty).
- Department Secretary Office: 310
- Area for faculty mailboxes, copier machine, and office supplies (located in 310).
- Seminar Room, (308): The room contains the Department library (see below for list of books), seminar table, flat panel television with computer hookup.
- In addition, the Department uses the open lab in Edgerly 106 for the Calculus Labs (Math 2300 and Math 2400). See below in the Technology section for more details.

The Department offices moved from Miller Hall to Edgerly Hall in the Summer of 2010. All of the space used was newly remodeled and all of the offices are spacious compared to those in Miller Hall. There are two restrooms on the same floor as the offices and there is a handicap lift in one of the stairwells, but no elevator in the building.   There is central air conditioning and heat in all of the rooms except for one office (E307) which is generally around 80° in the winter with no control over the heat.

The seminar room contains a medium-size conference table with 10 chairs. If all members of the Mathematics Department are present, the table is very crowded. The room contains the department library in four large bookcases. A listing of all books is given below. In addition, the seminar room has a large flat panel television with computer hookup.

4.   <u>Technology</u>

Faculty Computers

Each faculty member has the standard computer equipment that is issued by the Information Technology (IT) Department: a laptop, external monitor and docking station with mouse and keyboard. Each piece of computer equipment is located in the faculty member's office. According to University laptop policy, faculty members have a choice of an Apple Macbook (running Mac OSX, currently 10.6) or an HP laptop (running Windows 7). Each is replaced every three years. Many faculty have HP inkjet printers that were purchased by the Mathematics Department. These are not supported by the IT Department.

In addition to the standard software available on a campus-wide basis, there are 6 licenses of MathType purchased by the Department. Currently, the version is 6.7c.

Campus-Wide Software for faculty and students

All University-owned machines (faculty laptops and desktops) have the following software available:
- o   Microsoft Office Suite (version 2011)
- o   Maple 15
- o   Matlab R2010a
- o   Minitab 16
- o   Internet browsers (Internet Explorer, Firefox and/or Safari)

Other Mathematics Department Technology

In the Mathematics Department Seminar Room, there is a flat panel television with hookup for computers.

In an open area on the 3rd floor of Edgerly hall, there are two general-use computers; they are thin clients with standard software that is available across campus.

Also available for faculty use are 7 scientific and 5 graphing calculators, and an InFocus Multimedia projector (with pull-down screen)

Labs available for Student Access

There are many open labs available for all students.   The labs have either desktop PCs (running Windows 7) or Apple iMacs (dual-boot both Mac OSX and Windows). The computers have access to the local network as well as the internet. The software listed above is available on all these computers.

The Mathematics Department teaches the Calculus I and Calculus II lab portion of each class in Edgerly 106, a 25-seat lab containing PCs running Windows 7 and all software listed above. The

Calculus labs use Maple. The lab also has a podium computer with projector for the instructor as well as a large white board.

5.   Equipment/Materials

The Mathematics Department has numerous teaching tools that are used in the classroom. The following lists all the equipment and materials:

Inventory List of Teaching Materials and Equipment in the Mathematics Dept.

E 308
Books (2 large bookcases plus glass bookcase)
Projector screen
Flat screen TV
(See separate lists for books)

Manipulatives Cabinet in E310
Plastic 3D geometric shapes
Small blocks that link together
Cuisenaire rods
Cubicle counting blocks
Logical blocks
Algebra tile kits
College Algebra videos
Sage kit
Unifix boats
Plastic 3D geometric shapes
Compasses
Geometric strips
Square puzzle pieces
Felt pieces for felt board

T 111 Closet (mainly manipulatives for Math Ed. courses)
Base blocks
Fluid liquid measuring containers
Math Sets (protractor, compass, pencil, pencil sharpener etc.)
Compasses
Foam and plastic pattern blocks
Geo-boards
Mira's
Plastic and tape measures
Building materials for cardboard 3D shapes
Student Manipulative Kits from Prentice Hall for Middle School
Cuisinaire pentablocks
Classroom slide rule
Doll house pieces

Straws
Toshiba document camera and projector
Mitsubishi media projector
Plastic 3D geometric shapes

Chair's Office
Dr. Barry Light's Report (Review of mathematics programs and recruitment efforts at other institutions-2002)
MSCA Agreement (2004-2007 and 2009-2012)
Mathematics Department Self Study (2006)
InFocus Multimedia projector
Portable overhead projector

Department Secretary's Cabinet
TI & Regular Calculators
CDs College Algebra & Trigonometry and Precalculus
1 Homepage software
1 MathType software (old)
1 Derive for Windows guide
1 Maple V software
1 CD ea; Intro to stats, minitab, mathcad, mathworks, math soft
1 Parallel port card extension

List of books located in the Department Library (Edgerly 308)

Title:	Author:	Copyright:
College Algebra	Gordon Fuller	1974
Introductory Mathematical Analysis	Edgar D. Eaves & Robert L. Wilson	1964
Introductory Mathematical Analysis	Ernest E. Haeussler, Jr.	1996
Calculus And Analytic Geometry	Philip Gillett	1981
Biogeometric Calculus: A System with a Scale-Free Derivative	Michael Grossman	1983
Student Research Projects in Calculus	Marcus Cohen, Edward D. Gaughan, Arthur Knoebel, Douglas S. Kurtz and David Pengelley	1991
Schaum's Outline of Theory and Problems of Different and Integral Calculus 2	Frank Ayres, Jr., Ph.D.	1964,1950
Priming the Calculus Pump: Innovations and Resources	Thomas W. Tucker, Chair, Editor	1990
Preparing for a New Calculus	Anita Solow, Editor	1994
Wang Mathematics Laboratory Work Book	David Clayman	1967
Chaos Making New Science	James Gleick	1987
The Origins of Order	Stuart A. Kauffman	1993
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