

Schedule and Abstracts for Breakout Sessions

**AMS-MER Workshop on
Excellence in Undergraduate Education:
Diversification of Upper-Level Mathematics Programs
Nov. 7 - 10, 2002, Louisiana State University, Baton Rouge, LA**

Breakout Sessions: Friday 1:30 - 2:30

Room: Council

Presenters: Manoj Chari and Bogdan Oporowski, Peter Wolenski, LSU

Title: *Courses That Serve As The Gateway To The Math Major*

Abstract: Two courses will be discussed:

Solving Discrete Problems. This course was introduced to emphasize the problem solving aspects of elementary combinatorics, number theory and algebra. It develops fundamental concepts and results in these areas that can be motivated using concrete, easy-to-state problems. For students who have only been exposed to calculus, differential equations and linear algebra, this course serves as a bridge to more formal senior level courses in algebra, number theory and combinatorics. We will discuss the content of the course and the experience of students and faculty with this course.

Discrete Dynamical Systems. With only a prerequisite of first semester calculus, a considerable amount of interesting mathematics can be developed by studying one and two dimensional discrete dynamical systems. This talk will survey some of the topics covered in the LSU Math 2030.

Room: Atchafalaya

Presenters: Frank Neubrandner and Jim Madden, LSU

Title: *Teacher Preparation Programs*

Abstract: We will discuss two aspects of the LSU program for Teacher Preparation:

Recruiting, Preparing, and Supporting Secondary School Teachers in Mathematic
We discuss models for secondary certification programs in mathematics that are capable of attracting significantly more students, providing stronger preparation, and thus increasing both the quantity and quality of certification-ready candidates. In conjunction with such programs, mathematics departments become involved in new ways in providing support and professional development for in-service mathematics teachers.

Preparing Elementary and Middle School Teachers in Mathematic.
We will describe how the mathematics sequence for elementary and middle school teachers has evolved at LSU over the past decade, what it presently looks like and where it may be headed. We have succeeded in creating a program with deep content that is delivered in a way that models good classroom practices. Some challenges that we face are 1) developing a new course to meet recently imposed state requirements at the Middle School Level, 2) building into the courses explicit connections to standards-based elementary and middle-school curricula, 3) making the content of the courses more widely available and providing opportunities for teachers to continue learning more math through the math department (e.g., in professional development workshops).

Room: Castillian

Presenter: Efraim Armendariz and Kathy Davis, University of Texas

Title: *Restructuring An Undergraduate Degree Program: The University of Texas at Austin Case Study*

Abstract: In their plenary lecture, the authors will have discussed the historical background and perceived difficulties which led to a restructuring of the mathematics degree programs at the country's largest University.

In this breakout session, they will present a detailed examination of the issues that arose in designing a new set of degrees. They will also discuss the political process through which the Department was able to unite on a set of new degrees and obtain approval by the College, the University and the State.

Room: Red River

Presenters: Jim Fulmer and Tom McMillan, University of Arkansas at Little Rock

Title: *Reforming the Senior Seminar/Capstone course as an Assessment Tool*

Abstract: Our session will focus on a discussion of several questions relative to the senior seminar/capstone course for mathematics majors. What should be the structure for the senior seminar/capstone course? What are its components? Number of credit hours? Writing? Oral communication? Technology? ETS-MFT? Problem solving? Cooperative group work? What rubrics can be used to assess these skills? What assessment criteria and assessment methods can be used so as to provide evidence to be used in program/outcomes assessment? Our session will focus on a discussion of these issues and how they relate to program/outcomes assessment.

Breakout Sessions: Friday 3:00 - 4:00

Room: Council

Presenter: Lisa Mantini

Title: *A TA Training Course at Oklahoma State University*

Abstract: The TA training preparation program at OSU consists of two parts, a mentorship program and a 2 credit hour course which counts towards the Masters' degree or Ph.D. The course is required of all entering graduate students without prior teaching experience. In this session, both parts of the program will be described.

Room: Atchafalaya

Presenters: Tevian Dray, Oregon State University & Grinnell College

Title: *The Importance of Geometric Reasoning*

Abstract: As with Britain and America, mathematicians are separated from other scientists by a common language. Casual discussions with those in other disciplines suggests far more agreement than exists in fact. In a nutshell, mathematics is about functions, but science is about things. This has far-reaching implications not only for the teaching of lower-division mathematics "service" courses, but also for the training of mathematicians.

For the last several years, I have led an NSF-supported effort to "bridge the vector calculus gap" between mathematics and physics. The unifying theme we have discovered is to emphasize geometric reasoning, not (just) algebraic computation. In this session, I will illustrate the language differences between mathematicians and physicists in particular, and use this to motivate the importance of geometric reasoning for mathematicians and nonmathematicians alike.

Room: Castilian

Presenters: Kathleen Lopez, Vic Schneider, Roger Waggoner, University of Louisiana at Lafayette

Title: *Three Upper-Level Mathematics Courses for Secondary Teachers and Others*

Abstract: The Mathematics Department at the University of Louisiana at Lafayette has spent much time and energy reforming the mathematics courses that are designed primarily for the preparation of teachers. In particular, the College Geometry course required for secondary mathematics certification has been reformed and upgraded with LaCEPT (Louisiana Collaborative for the Excellence in the Preparation of Teachers) support. Prior to the LaCEPT Campus Renewal Projects, two other senior-level courses for secondary teachers, Problem Solving and Abstract Algebra/Number Theory, were redesigned in accordance with the recommendations in A Call for Change. These courses were specifically commended in the report, "Reforming Preservice Mathematics and Science Teachers Preparation in Louisiana (1992)".

While these courses were designed to meet the specific needs of preservice secondary mathematics teachers, they are open to others who meet the prerequisite. The majority of such students have enrolled in the College Geometry course. Vic Schneider was primarily responsible for the redesign of this course and has taught it since the mid-nineties. Both Roger Waggoner and Kathleen Lopez have taught the Problem Solving and Abstract Algebra/Number Theory courses in the past. The three will describe the goals and structure of the courses and give examples of work assigned.

Room: Red River

Presenter: Joel Iiams, University of North Dakota

Title: *Cryptological Mathematics as a Multipurpose, Upper-Level, Undergraduate Course*

Abstract: I have always been interested in the value of mathematics in other disciplines. This has served me well as a pedagogical aid when I have taught lower-level service courses. Until recently this has not applied to any of the upper-division classes I have taught, since they have been almost entirely composed of mathematics majors. I personally find the lack of non-majors in these courses very troubling in light of the power of the content. I have been looking for solutions to this problem for a few years. We have found that a senior-level course in cryptology which puts equal emphasis on cryptanalysis and cryptography is a plausible solution.

Whereas 0 computer science majors registered for Math435 - Theory of Numbers - the last time it ran, 16 completed a course in cryptological mathematics last Fall. In addition to attracting non-majors the course aids math majors in making connections between

various subdisciplines of mathematics. As such it might be used as a capstone experience for math majors.

Breakout Sessions: Saturday 1:30 - 2:30

Room: E 131

Presenter: Bryan Hearsey, Lebanon Valley College, Annville PA

Title: *Putting an Actuarial Component in your Curriculum*

Abstract: Given one or two very interested people, real departmental support, and administrative backing, you are close to having an actuarial component in your curriculum. The core of actuarial education is lower division mathematics (three semesters of calculus and linear algebra) and economics (preferably micro and macro to the intermediate level, the typical junior level courses in probability and statistics, and an introduction to mathematical finance. You already have all this with the likely exception of the mathematical finance.

Would you like to provide another option for your students, to broaden your perspective and that of some colleagues, to develop interdepartmental relationships in the direction of business and economics, to provide a national standard for you and your students. I have to add that you may have to deal with colleagues who question how you can use ‘business’ and ‘mathematics’ in the same sentence. You may have to figure out how your broadened perspective fits into the academic evaluation process (it may help to be tenured). You will likely have to deal with continually changing actuarial education expectations. I can help you see how to do it, only you know whether you should.

Room: E 130

Presenter: Sylvia T. Bozeman, Spelman College

Title: *Preparing for Successful Graduate School Experiences*

Abstract: This session Preparing for Successful Graduate School Experiences will expand on the plenary presentation which explores the changes that can be made to a classical curriculum in order to better prepare students for success in graduate programs. Beyond the curriculum there are several experiences that can be equally important in creating interest in graduate education and in building self-confidence, independence, technical communication skills, and other skills that help to insure success in graduate programs. This session will focus on 1) the establishment of special programs and activities that might provide some pre-professional development; and 2) the role of faculty mentoring as students explore the advanced study option. Participants will evaluate the level of receptivity and hospitality in their departments as a basis for attracting and retaining undergraduate majors in order to increase the graduate education pool at the early stages.

We will also consider efforts to smooth the transition from college to graduate school for groups currently under-represented in the mathematics community.

Room: E 134

Presenter: Eric Kostelich

Title: *Scientific Computing: Not the Usual Numerical Analysis Course*

Abstract: Surveys by the U. S. Bureau of Labor Statistics show that the great majority of individuals with bachelor's and master's degrees in mathematics work in areas that require significant computer skills. Yet most undergraduate mathematics programs require nothing more than an introductory course in computing (if that). Compared to many of their peers in engineering, chemistry, and physics, mathematics majors have weak computing skills. This lack of experience hampers the job prospects of those who go to work after completing their baccalaureate degrees. Many graduate students who decide to pursue research projects in applied mathematics are at a loss when they need to do simulations that cannot be performed easily by a canned software program. This workshop discusses a course in scientific programming, directed at majors in mathematics, physics, chemistry, and computer science, that attempts to fill this gap. The course is organized around the overriding themes of handling floating-point data and the skills needed to design, debug, and run numerically-intensive codes.

Room: E 135

Presenter: Terry Lawson, Tulane University

Title: *The role of projects in the major program*

Abstract: This session will discuss how Tulane has been integrating projects into its upper level curriculum in an effort to broaden the student's exposure to a wider range of mathematics and involve students to research experiences where they work closely with a faculty member. Our senior seminar plays a key role in this program, but we are attempting to make significant projects a component of all of our upper level courses. Examples will be given of what we have been doing and how it is affecting student learning. We hope this session will motivate others to share their experiences and stimulate a discussion of how projects can best be used.

Breakout Sessions: Saturday 3:00 – 4:00

Departments meeting with each other by common interests

Group I Departments continuing in the AMS-MER Project, *Excellence in Undergraduate Education*

Room: E 130

Arizona State University
Clayton College and State University
Gallaudet University
Loras College
Louisiana State University
Le Moyne College
Roosevelt University
University of Arkansas at Little Rock
University of New Haven
University of North Dakota
University of Portland
Voorhees College

Group II Departments from Public Institutions

Room: E 131

Columbus State University
Florida State University
Jackson State University
Northeastern State University
Northern Kentucky University
SUNY Oswego
University of Alaska at Anchorage
University of Louisiana at Lafayette
University of Massachusetts at Boston
University of Maryland Eastern Shore

Group III Departments from Private Institutions

Room: E 134

Brewton-Parker College
Elmira College
Hollins University
John Carroll University
Tulane University