MIDDLE SCHOOL NUMBER AND ALGEBRA: SREB MG COURSE CADRE OF COURSES

Fall 2005-Spring 2006

WVU Math 693: **Middle School Number & Algebra I** Course Registration Number: TBA	**WVU C&I 693:** **Middle School Number & Algebra Teaching I** Course Registration Number: TBA
Synchronous or Asynchronous Monday after 5:00 p.m. (2 hour live/recorded session)	Synchronous or Asynchronous Monday after 5:00 p.m. (1 hour live/recorded session)
Synchronous Thursday 8:00-9:00 p.m. (1 hour live session)	Synchronous Thursday 8:00-9:00 p.m. (1 hour live session)
Credit: 2 hours	Credit: 1 hour

NOTE: Completion of the Number and Algebra Cadre requires taking part II of the above courses in the spring semester:

- Middle School Number and Algebra II
- Middle School Number and Algebra Teaching II

Middle School Mathematics Course Cadres

The Institute for Mathematics Learning (IML) at West Virginia University, in partnership with Marshall University, the West Virginia Department of Education, the Benedum Foundation, and Project MERIT, created a graduate level professional development program for middle school mathematics teachers that addresses standards based mandated curriculum transformations and the No Child Left Behind (NCLB) call for highly qualified teachers. The distance education program includes four cadres of professional development courses, each with 4-credits of mathematics content courses integrated with 2-credits of mathematics education courses offered over an academic year. Middle School Number and Algebra is one of the cadres of courses in this program and is being brought to you through a partnership with the South Regional Education Board (SREB). Completion of the courses in this program can be used for:

1. **Endorsement in Middle School Mathematics** for those who have an Elementary education certificate and pass the state Middle School Mathematics certification exam.
2. **Application toward a Master's Degree in Secondary Education** with an emphasis in middle school mathematics for in-service teachers.
3. **Preparation for National Board Certification** or highly qualified teacher status as required by NCLB.

Instructor Information

Dr. Mike Mays
Office: 308E Armstrong
Phone: 304-293-2011 ext. 2324
e-mail: mays@math.wvu.edu

Dr. Robert Mayes
Office: 411C Armstrong Hall
Phone: 304-293-2011 ext 2304
e-mail: rmayes@math.wvu.edu

Texts for Fall 2005.

- Musser, G., Burger, W. & Peterson, B. (2003). *Mathematics for Elementary Teachers: A Contemporary Approach, 6th Edition.* New York: John Wiley & Sons, Inc. Cost: $90.91.
- Kilpatrick, J., Martin, W. G., and Schifter, D. (2003). *A Research Companion to Principles and Standards for School Mathematics.* NCTM: Reston, VA. Cost: $48.95 ($39.16 if NCTM member)

Texts for Spring 2005

- Mayes, R. & Reitz, J. (2003). *ACT in Algebra*. Boston: WCB McGraw-Hill. Cost: TBA

ORDERING INFORMATION: We recommend that you order *Mathematics for Elementary Teachers: A Contemporary Approach, 6th Edition* from **Amazon.com**. To order:

1. Go to website at http://www.amazon.com
2. Search Books with key words from title, select text.
3. Add to shopping cart
4. Proceed to checkout and follow on-line directions to purchase.

We recommend that you order the NCTM materials directly through NCTM. You can do this from their web site.

1. Go to website at http://nctm.org/
2. Select *Publications/Products*
3. Search for text you want
4. Add to cart
5. Proceed to checkout and follow on-line directions to purchase.

Order online or through the NCTM customer service number 1-800-235-7566.

Support Text: You do not have to purchase these texts. We will view the topics of number and algebra from an advanced perspective. We will also apply cognitive science and classroom based research on the teaching and learning of mathematics to the topics of number and algebra. Resources used to support these goals include:

- McCoy, N. & Janusz, G. (1987). *Introduction to Modern Algebra, 4th Edition.* Newton, MA: WCB Publishers.
- Sowder, J. and Schappelle, B. (2002). *Lessons Learned from Research.* NCTM: Reston, VA. Cost: $35.95 ($28.76 if NCTM member)
- Usiskin, Z., Peressini, A., Marchisotto, E., Stanley, D. (2003) *Mathematics for High School Teachers An Advanced Perspective,* Prentice Hall, ISBN 0-13-044941-5

- Ore, O. *Number Theory and Its History*. Dover Classics of Science and Mathematics. Paperback ISBN: 0486656209
- National Council of Teacher of Mathematics. (2000). *Principals and Standards for School Mathematics*. Reston, VA. Cost: $52.95 ($42.36 if NCTM member)
- Wagner, S. (1993). *Research Ideas for the Classroom, Volume 2: Middle Grades Mathematics.* NCTM: Reston, VA. Cost: $22.95 ($18.36 if NCTM member).
- Curcio, F. et.al. (1994). *Understanding Rational Numbers and Proportion: Addenda Series, Grades 5-8.* NCTM: Reston, VA. Cost: $21.95 ($17.56 if NCTM member)
- *Navigating through Algebra in Grades 6-8*. NCTM: Reston, VA. Cost: $31.95 ($25.56 if NCTM member)
- Bright, G., Brewer, W. McClain, K. and Mooney, E. (2003). *Navigating through Data Analysis in Grades 6-8*. NCTM: Reston, VA. Cost: $31.95 ($25.56 if NCTM member) Friel, S., Rachlin, Sid, and Doyle, D. (2001).
- Addenda Series of Grades 6-8 offers significant support for teaching number and algebra, including *Patterns and Fuctions: Addenda Series, Grades 5-8; Dealing with Data and Change: Addenda Series, Grades 5-8;* and *Developing Number Sense in the Middle Grades: Addenda Series, Grades 5-8.*

Pre-requisite: These courses are offered to teachers who are certified to teach in grades 6-8 with either multi-subject or mathematics certification, and who have a minimum of 6-9 hours of math or math education.

Course Description: The overall objective of the course is to increase knowledge and competence for middle school mathematics teachers in both content and pedagogy related to the teaching and learning of number and algebra. There are two primary mathematics objectives in each of these content areas:

1. Improve understanding of basic concepts and skills in the area of number and algebra.
2. View number and algebra from an advanced perspective.

The mathematical topics will include:

Sets, whole numbers, integers, rational numbers, real numbers, Binary Operations, Division Algorithm, Well-Ordering Principle, General Sums/Products, Order, Dense, and Complete properties, Rings, Integral Domains, and Fields, Concepts of Divisibility, Fundamental Theorem of Arithmetic, Distribution of Primes, Number Theory, Sequences and Inductive Reasoning, Proof by Induction, Recursive Reasoning and Recurrence Relations, Study of Change – linear and curvilinear, Method of Finite Differences, Exponents and Polynomial Expressions, Polynomial Rings, Method of Iteration and Linear Difference Equation, Line of Best Fit, Function as Process and Object, Algebra of Functions and Inverse, and Mathematical Modeling using Method of Least Squares.

The curriculum and instruction course has the following goals:

1. Relate the advanced mathematical topics above to topics taught in the middle school classroom.
2. Examine current research in teaching and learning mathematics.
3. Explore model curriculum such as Connected Mathematics.

In addition, applications of each topic will be explored to demonstrate the utility of the mathematics in the real world. Technology will be used to explore number and algebra concepts, and to model and solve real world problems. Technology for this course will include graphing calculators, CAS, web resources, Vista WebCT course management software, JAVA applets, and a variety of software tools for exploring number and algebra. Finally, hands-on manipulative activities for exploring number and algebra concepts will be demonstrated.

Course Format: The Middle School Number and Algebra courses are designed to be delivered via distance education during the teachers' academic school year, offering teachers access to content based professional development in their home region.

- The fall courses consists of six 2 week blocks, with the first week focusing on mathematical content and the second week focusing on the teaching and learning of mathematics.
- Teachers will be given assignments on-line that focus on mathematical concepts and skills as well as teaching and learning mathematics. Vista WebCT will serve as the course management software for posting assignments and assessment.
- Teachers will communicate with the instructor concerning their understanding of the assignments via discussion groups and chat rooms. A virtual office hour will be held where questions can be addressed using a discussion group format conducted via the Centra software package.
- An on-line class session that focuses on exploring middle school mathematical concepts from an advanced perspective as well as mathematics education research and model curriculum will be provided via Centra.

Middle School Number and Algebra

Fall Semester 2005 Number and Algebra I		
Dates	Contact Type	Contact Hours
September 1 (live session)	Introduction Technology Introduction Miniature Block	2 hours
Sept 2 – Dec 1	Distance Ed. (12 weeks)	42 hours
Dec 5	Final and Project	2 hours
Nov 21 – 25	Thanksgiving Vacation	No class
Spring Semester 2006 Number and Algebra II		
Jan 27 – April 27	Distance Ed. (12 weeks)	42 hours
March	State Presentation Project	3 hours
May 1	Final	
Mar 13-17	Spring Break	No class

The following is a more detailed account of weekly course activities. We call it the **ACT Paradigm**: **A**ctive **A**ssignment, **C**onceptual **C**lass session, **T**alk **T**ogether about session.

1. **Math Content week activities**
   - **ASSIGNMENT: Understanding Basic Concepts and Skills (1 contract hour)**: On Friday by 5:00 p.m. an active reading assignment over the text and other support materials will be assigned. Active reading will involve:
     a. Focus questions for the reading that will stress key concepts and skills to be mastered.
     b. Focus problems assigned to assess conceptual understanding and skill acquisition. A quiz over skills and concepts will be posted on **Vista WebCT**. The Quiz must be completed by the following Friday.
     c. A forum will be established on **Vista WebCT** where discussion groups will be required to post responses to the focus questions. Discussion groups consist of 4 to 5 members with an alternating discussion leader. The leader will gather consensus responses to the focus questions for their group and post them by Thursday at 8:00 p.m.
   - **CLASS SESSION: Number and Algebra from an advanced perspective (2 contact hours):** On Monday from 5:00 p.m. to 7:00 p.m. a live class session will be provided for teachers. Teachers can attend the session live via **Centra** or can watch the session tape delayed. The focus will be explorations of mathematical concepts, applications, and theory related to the basic concepts and skills reviewed earlier in the week.
     a. The Centra system allows for two-way audio and video communication with teachers, interaction on a white board or Power Point slides, demonstrations using the overhead camera, and sharing software tools and web resources. We will demo this software at the first meeting.
     b. Teachers can attend the sessions live or view them tape delayed. The sessions must be viewed before Thursday at 8:00 p.m.
   - **TALK TOGETHER: about Discussion Session (1 contact hour):** On Thursday from 8:00-9:00 p.m. a synchronous (live) session will be held which all participants must attend. The focus of this session will be discussion of the readings and review of questions over Monday's class session.

2. **Math Education Content week activities**
   - **ASSIGNMENT: Innovative Curriculum and Research on Learning (1 contact hour):** On Friday by 5:00 p.m. an active reading assignment over the text and other support materials will be assigned. Active reading will involve:
     a. Focus questions over a model curriculum, such as Connected Mathematics, and over research on learning and teaching the mathematical concept of the week.
     b. Focus problems and pedagogical questions assigned to assess understanding of teaching and learning concepts. A quiz over concepts

and teaching ideas will be posted on **Vista WebCT**. The Quiz must be completed by the following Friday.

c. A forum will be established on **Vista WebCT** where discussion groups will be required to post responses to the focus questions. Discussion groups consist of 4 to 5 members with an alternating discussion leader. The leader will gather consensus responses to the focus questions for their group and post them by Thursday at 8:00 p.m.

- **CLASS SESSION: Resources and Connections (1 contact hour):** On Monday from 5:00 p.m. to 6:00 p.m. a live class session will be provided for teachers. Teachers can attend the session live via **Centra** or can watch the session tape delayed. The focus will be discussion of a model curriculum, relating research on learning and teaching to the classroom, and demonstration of web-based and hands-on instructional activities.
- **TALK TOGETHER: about Discussion Session (1 contact hour):** On Thursday from 8:00-9:00 p.m. a synchronous (live) session will be held which all participants must attend. The focus of this session will be questions on the model curriculum, questions on relating research to the classroom, and sharing innovate methods for teaching the topic of the week.

Evaluation: Multiple forms of assessment will be used to measure your understanding. The distribution of these assessments is:

Assessment	Percent of Grade
1. Focus Questions and Homework	20%
2. Participation in Group Discussions	10%
2. Exams	50%
3. Activities/Projects	20%

GRADING SCALE: 100-90 A; 89-80 B; 79-70 C; 69-60 D; 59-0 F.

West Virginia University is committed to social justice. We concur with that commitment and expect to foster a nurturing learning environment based upon open communication, mutual respect, and non-discrimination. Our University does not discriminate on the basis of race, sex, age, disability, veteran status, religion, sexual orientation, color or national origin. Any suggestions as to how to further such a positive and open environment in this class will be appreciated and given serious consideration.

If you are a person with a disability and anticipate needing any type of accommodation in order to participate in this class, please advise us and make appropriate arrangements with Disability Services (293-6700).

Middle School Number and Algebra 1
SCHEDULE FOR FALL 2005

Date	Day	Mode	Topic
Sept 1	*R*	Sync	*Introduction to Centra and Vista WebCT* *Miniature Block: Math Content* *Miniature Block: Mathematics Education*
Sept 2	*F*	Async	*Math Content 1: Sets and Whole Numbers*
Sept 5	*M*	Sync/Async	
Sept 8	*R*	Sync	
Sept 9	*R*	Async	*Math Teaching 1: Sets and Whole Numbers*
Sept 12	*M*	Sync/Async	
Sept 15	*R*	Sync	
Sept 16	*F*	Async	*Math Content 2: Integers*
Sept 19	*M*	Sync/Async	
Sept 22	*R*	Sync	
Sept 23	*F*	Async	*Math Teaching 2: Integers*
Sept 26	*M*	Sync/Async	
Sept 29	*R*	Sync	
Sept 30	*F*	Async	*Math Content 3: Order and Exponents*
Oct 3	*M*	Sync/Async	
Oct 6	*R*	Sync	
Oct 7	*F*	Async	*Math Teaching 3: Order and Exponents*
Oct 10	*M*	Async	
Oct 13	*R*	Sync	
Oct 14	*F*	Async	*Math Content 4: Rational Numbers*
Oct 17	*M*	Sync/Async	
Oct 20	*R*	Sync	
Oct 21	*F*	Async	*Math Teaching 4: Rational Numbers*
Oct 24	*M*	Sync/Async	
Oct 27	*R*	Sync	
Oct 28	*F*	Async	*Math Content 5: Real Numbers*
Oct 31	*M*	Sync/Async	
Nov 3	*R*	Sync	
Nov 4	*F*	Async	*Math Teaching 5: Real Numbers*
Nov 7	*M*	Sync/Async	
Nov 10	*R*	Sync	
Nov 11	*F*	Async	*Math Content 6: Proportional Reasoning and Number Theory*
Nov 14	*M*	Sync/Async	
Nov 17	*R*	Sync	
Nov 18	*F*	Async	*Math Teaching 6: Proportional Reasoning and Number Theory*
Nov 28	*M*	Sync/Async	
Dec 1	*R*	Sync	
Dec 5	*M*	Async	*Final*

Middle School Number and Algebra II
SCHEDULE FOR SPRING 2006

Date	Day	Mode	Topic
Jan 27	*F*	Async	*Math 1: Congruence and Number Theory*
Jan 30	*M*	Sync/Async	
Feb 2	*R*	Sync	
Feb 3	*F*	Async	*Math Teaching 1: Number Theory*
Feb 6	*M*	Sync/Async	
Feb 9	*R*	Sync	
Feb 10	*F*	Async	*Math 2: Relation and Function*
Feb 13	*M*	Sync/Async	
Feb 16	*R*	Sync	
Feb 17	*F*	Async	*Math Teaching 2: Function Concept*
Feb 20	*M*	Sync/Async	
Feb 23	*R*	Sync	
Feb 24	*F*	Async	*Math 3: Polynomial Functions*
Feb 27	*M*	Sync/Async	
Mar 2	*R*	Sync	
Mar 3	*F*	Async	*Math Teaching 3: Polynomial Functions*
Mar 6	*M*	Sync/Async	
Mar 9	*R*	Sync	
Mar 10	*F*	Async	*Math 4: Polynomial Rings*
SPRING BREAK			
Mar 20	*M*	Sync/Async	
Mar 23	*R*	Sync	
Mar 24	*F*	Async	*Math Teaching 4: Higher Degree Polynomials*
Mar 27	*M*	Sync/Async	
Mar 30	*R*	Sync	
Mar 31	*F*	Async	*Math 5 Mathematical Modeling*
Apr 3	*M*	Sync/Async	
Apr 6	*R*	Sync	
Apr 7	*F*	Async	*Math Teaching 5: Mathematical Modeling*
Apr 10	*M*	Sync/Async	
Apr 13	*R*	Sync	
Apr 14	*F*	Async	*Math 6: Least Squares Modeling*
Apr 17	*M*	Sync/Async	
Apr 20	*R*	Sync	
Apr 21	*F*	Async	*Math Teaching 6: Line of Best Fit*
Apr 24	*M*	Sync/Async	
Apr 27	*R*	Sync	
May 1	*M*	Async	*Final*