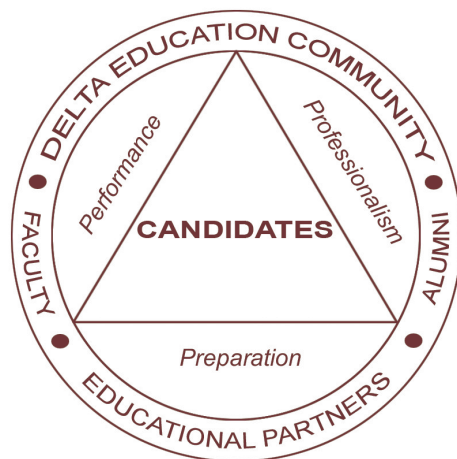


Delta State University
Division of Teacher Education
Course Syllabus
Spring 2014
MAT 131

- I. **Course Designation:** MAT 131
Course Title: Number Systems of Arithmetic
Course Description: MAT 131. NUMBER SYSTEMS OF ARITHMETIC. Structure and properties of the number systems of arithmetic. Primarily for prospective or in-service teacher. Prerequisites: MAT 103 or 104 with a C or better. 3
- II. **Conceptual Framework:**

DELTA P³ MODEL



Vision: The Delta State University College of Education promotes a vibrant educational community committed to preparing capable and confident candidates who can positively affect learning outcomes of students in the P-12 school setting. Appropriately illustrated by the Delta triangle, the model reflects candidate development through the triad of preparation, performance and professionalism, supported by the greater Delta educational community (faculty, educational partners, and alumni).

Guiding Principles:

1. **Education is a lifelong endeavor**, requiring an ever-expanding content knowledge base, a repertoire of skills, and a broad experience base. (GP1)
2. **Education is interactive and reflective**, a process that is accomplished through assessment and reflection of a collaborative nature. (GP2)
3. **Education is culturally contextualized**, requiring both an understanding and appreciation of the diversity of all individuals within the learning community. (GP3)
4. **Education is dynamic**, with change being driven by assessment data and the needs of all segments of the educational community. (GP4)
5. **Education is enhanced by technology**, infused throughout programs and services. (GP5)

III. **General Course Goals:** At the end of this course the candidate should be able to solve problems using Polya's four-step procedure, recognize patterns in problems, and articulate their reasoning, strategies, and multiple representations of the solution. With respect to number systems, the candidate will develop a conceptual understanding of various numeration systems and the operations on whole numbers. The candidate will further investigate the nature of numbers and sets. Moreover, candidates will investigate prime and composite numbers and the Fundamental Theorem of Arithmetic. Candidates will use a variety of concrete and virtual interactive modeling tools to aid in their problem solving.

IV. **General Course Objectives:** Upon completion of the course, the student will be able to:

1. Use Polya's problem solving procedure to solve mathematics problems.
2. Solve higher-order mathematics problems using a variety of problem solving strategies.
3. Explain their reasoning and the strategies that they used to solve mathematics problems.
4. Provide multiple representations of solutions to mathematics problems.
5. Analyze student work to assess understanding and diagnosis areas in need of remediation.
6. Explain and use a variety of concrete and virtual modeling tools to aid in their problem solving process.
7. Explain and use a set model and set notation to model and solve problems.
8. Explain and use Venn Diagrams to solve set problems.
9. Convert between base 10 and various other bases.
10. Describe various number systems and convert between them.
11. Add, subtract, multiply, and divide Whole Numbers using algorithms.
12. Explain and use properties of Whole Numbers.

V. **Subject Matter/Content:**

Course Materials:

1. **WileyPLUS:** This software contains an electronic version of the textbook used in this course, supplemental resources, all independent assignments, and all assessments. The publishers are allowing us to use this software free this semester!
2. **Textbook:** If you do not like reading electronic versions of textbooks, you can purchase the physical textbook. Musser, G.L., Peterson, B.E., Burger, W.F. (2011). *Mathematics for Elementary Teachers: A Contemporary Approach, 9th Edition*, Wiley. ISBN: 9781118026540.
3. **The Common Core State Standards** will be a guide to all that is covered in this class. They may be found on line at: http://www.corestandards.org/assets/CCSSI_Math%20Standards.pdf
4. **Instructional Resources:** Ewing 222, IRC, Internet, and library.
5. **Notebook and pencil**

Content Topics:

1. Problem Solving Procedure & Strategies
2. Sets, Whole Number, and Numeration
3. Whole Number Operations and Properties
4. Mental, Written, and Electronic Whole Number Computation

Technology Statement: Candidates will use a variety of technology resources in this course. These include, but are not limited to Virtual Manipulative Tools, Canvas Learning Management System, the Internet, and Microsoft Excel.

Diversity Proficiencies Expected of all Candidates: Candidates will:

1. Develop the capacity to teach in diverse settings with students and colleagues of varying backgrounds, ethnicities, capabilities, and beliefs. (CF 1, 3; DRS 3)
2. Identify contextual factors that may influence student learning and act upon those factors in planning curriculum and instruction. (CF 2, 3, 4; DRS 2)
3. Establish classroom and school climate that reflects the belief that all students have the ability to learn. (CF 2, 3, 4; DRS 1, 2, 4)
4. Differentiate instruction and experiences based on contextual factors and the diverse needs of learners. (CF 2, 3, 4, 5; DRS 1, 2, 4)
5. Use appropriate assessment strategies to serve the diverse needs of learners. (CF 3, 4; DRS 1,2)

*CF = Delta P³ Model; DRS = Dispositions Rating Scale

Specific Course Objectives: Candidates will be able to:

1. Describe and use Polya's four-step procedure to solve problems.
2. Describe and use the *Guess & Test*, *Draw a Picture*, *Use a Variable*, *Look for a Pattern*, *Make a List*, *Solve a Simpler Problem*, *Draw a Diagram*, and *Use Direct Reasoning* strategies to solve problems.
3. Produce multiple representations of their solutions to problems.
4. Use spreadsheets to model patterns.
5. Use virtual manipulative tools to model and solve problems.
6. Define: set, element, one – to – one correspondence, subset, proper subset, equal, equivalent, disjoint, union, intersection, complement, relative complement, Cartesian product.
7. Use set notation to model and solve problems.
8. Use Venn Diagrams to model and solve problems.
9. Explain the difference between a number and a numeral.
10. Determine the cardinality of a set and be able to produce a set of a given cardinality.
11. Order whole numbers.
12. Convert to and from the Tally, Babylonian, Egyptians, Roman, and Mayan systems and the Hindu-Arabic Numeration system.
13. Describe and illustrate base ten concepts using bundles of sticks and base ten blocks.
14. Describe, write and represent numbers in various bases.
15. Convert between a base other than ten and a base ten.
16. Express numbers in both expanded and standard forms.
17. Use a set model and set notation to represent and solve addition and subtraction problems.
18. Use a measurement model to represent and solve addition, subtraction, and multiplication problems.
19. Explain and use the Identity, Commutative, and Associative properties of addition and multiplication.
20. Explain and use the take-away, missing – addends, and comparison approaches to subtraction.
21. Explain and use the definition of multiplication as repeated addition, rectangle array, and Cartesian product.
22. Explain and use the Distributive Property of Multiplication over Addition and Distributive Property of Multiplication over Subtraction.
23. Explain and use the Multiplication Property of Zero.
24. Explain and use the definition of Division by Missing Factor and the Division Algorithm.
25. Explain and use the definition of Less Than and the Transitive Property of Less Than for Whole Numbers.
26. Explain, evaluate, and simplify exponential expressions.
27. Explain and use estimation methods to mentally solve arithmetic problems.
28. Explain, use, and model the standard algorithms for addition, subtraction, multiplication, and division.
29. Explain and use the lattice method to solve multiplication problems.
30. Explain and use the scaffold method to solve division problems.
31. Explain and use the equal additions algorithm.

VI. Major Course Activities: Research shows that people learn best from concrete experience, interacting with the content and with other learners, engaging in challenging tasks, being held accountable for their work, and receiving frequent feedback on their progress. The following course activities have been designed based on these principles:

1. **Readings & Individual Assignments** – Outside of class students will be responsible for individually completing reading assignments from the course textbook. These will prepare students for the Readiness Assurance Tests, classroom application tasks, individual assignments, and cumulative assessments.
2. **Readiness Assurance Tests (RATs):** Each of the 4 instructional sequences will *begin* with a multiple-choice RAT (with 10 items and 5 possible responses per item) *based on the assigned readings*. You will actually take each RAT twice, once on your own and once as a team. You will use instant feedback forms to take the team RAT which will provide your team with the opportunity to earn partial credit (1st response = 10 pts., 2nd response = 5 pts., 3rd response = 2 points, 4th or 5th response = 0 points). Your team will also be given the opportunity to write a evidence-based appeal after tests.
3. **Mini-Lecture** – After each RAT I will provide the class with direct instruction aimed at addressing overarching themes, summary reflections, and un-resolved questions. There will also be brief demonstrations of how to use tools.
4. **Application Tasks:** After mini-lectures you will spend the majority of class working on application tasks. You will be expected to interact with your team members during application tasks. This interaction should include checking strategies, representations, and solutions with your team members. Students will receive credit for their participation in application tasks. The application tasks will also prepare you for your individual assignments and cumulative assessments. Students will also evaluate their team members' performance.
5. **Cumulative Assessments:** There will be a cumulative assessment at the end of each instructional sequence and a final cumulative assessment at the end of the course.

Important Course Dates:

Date	Topics Addressed	Assignments
Instructional Sequence One: Problem Solving Procedure & Strategies Weeks 1-4		
Weeks 1 – 4 (Monday, January 13 th – Sunday, February 9 th)	<ul style="list-style-type: none"> ◇ Describe and use Polya’s four-step procedure to solve problems. ◇ Describe and use the <i>Guess & Test, Draw a Picture, Use a Variable, Look for a Pattern, Make a List, Solve a Simpler Problem, Draw a Diagram, and Use Direct Reasoning</i> strategies to solve problems. ◇ Produce multiple representations of their solutions to problems. ◇ Use spreadsheets to model patterns. ◇ Use virtual manipulative tools to model and solve problems. 	<ul style="list-style-type: none"> ◇ Read Chapter 1 ◇ Readiness Assurance Test (January __, 2014) ◇ Rational Number Test (January __, 2014) ◇ Independent Assignments: <ul style="list-style-type: none"> ○ 1.1 Due: _____ ○ 1.2 Due: _____ ◇ TEST ONE _____
Instructional Sequence Two: Sets, Whole Number, and Numeration Weeks 5-7		
Week 5-7 (Monday, February 10 th – Sunday, March 2 nd)	<ul style="list-style-type: none"> ◇ Define: set, element, one – to – one correspondence, subset, proper subset, equal, equivalent, disjoint, union, intersection, complement, relative complement, Cartesian product. ◇ Use set notation to model and solve problems. ◇ Use Venn Diagrams to model and solve problems. ◇ Explain the difference between a number and a numeral. ◇ Determine the cardinality of a set and be able to produce a set of a given cardinality. ◇ Order whole numbers. ◇ Convert to and from the Tally, Babylonian, Egyptians, Roman, and Mayan systems and the Hindu-Arabic Numeration system. ◇ Describe and illustrate base ten concepts using bundles of sticks and base ten blocks. ◇ Describe, write and represent numbers in various bases. ◇ Convert between a base other than ten and a base ten. ◇ Express numbers in both expanded and standard forms. 	<ul style="list-style-type: none"> ◇ Read Chapter 2 ◇ Readiness Assurance Test (February __, 2014) ◇ Independent Assignments: <ul style="list-style-type: none"> ○ 2.1 Due: _____ ○ 2.2 due: _____ ○ 2.3 due: _____ ◇ TEST TWO _____
Instructional Sequence Three: Whole Number Operations and Properties Weeks 8-11		
Weeks 8-11 (Monday, March 3 rd – Sunday, April 6 th)	<ul style="list-style-type: none"> ◇ Use a set model and set notation to represent and solve addition and subtraction problems. ◇ Use a measurement model to represent and solve addition, subtraction, and multiplication problems. ◇ Explain and use the Identity, Commutative, and Associative properties of addition and multiplication. ◇ Explain and use the take-away, missing – addends, and comparison approaches to subtraction. ◇ Explain and use the definition of multiplication as repeated addition, rectangle array, and Cartesian product. ◇ Explain and use the Distributive Property of Multiplication over Addition and Distributive Property of Multiplication over Subtraction. ◇ Explain and use the Multiplication Property of Zero. ◇ Explain and use the definition of Division by Missing Factor and the Division Algorithm. ◇ Explain and use the definition of Less Than and the Transitive Property of Less Than for Whole Numbers. ◇ Explain, evaluate, and simplify exponential expressions. 	<ul style="list-style-type: none"> ◇ Read Chapter 3 ◇ Readiness Assurance Test (March __, 2014) ◇ Independent Assignments: <ul style="list-style-type: none"> ○ 3.1 Due: _____ ○ 3.2 due: _____ ○ 3.3 due: _____ ◇ TEST THREE _____
Instructional Sequence Four: Mental, Written, and Electronic Whole Number Computation Weeks 12-14		
Weeks 12-14 (Monday, April 7 th – Sunday, April 27 th)	<ul style="list-style-type: none"> ◇ Explain and use estimation methods to mentally solve arithmetic problems. ◇ Explain, use, and model the standard algorithms for addition, subtraction, multiplication, and division. ◇ Explain and use the lattice method to solve multiplication problems. ◇ Explain and use the scaffold method to solve division problems. ◇ Explain and use the equal additions algorithm. 	<ul style="list-style-type: none"> ◇ Read Chapter 4 ◇ Readiness Assurance Test (April __, 2014) ◇ Independent Assignments: <ul style="list-style-type: none"> ○ 4.1 Due: _____ ○ 4.2 due: _____ ○ 4.3 due: _____ ◇ TEST FOUR _____
Week 15 - Monday, April 27 th – Friday, May 2 nd - Review Week Week 16 - Monday, May 5 th – Friday, May 9 th - Final Examination Week		

VII. How Grades Will Be Earned: (A=94-100; B=84-93; C= 74-83; D=70-73; F=Below 70)

- 15% Readiness Assurance Tests (10% individual and 10% team; 3 RAPs)
- 15% Unit Tests (4 @ the end of each unit)
- 5% Team Member Performance Evaluation (Peer graded @ End of semester) 15% Team Tasks (14 weekly grades)
- 20% Team Tasks (14 weekly grades)
- 20% Independent Assignments (**minimum acceptable grade = C, Full letter grade reduction per day late**)
- 25% Final Examination

Managing your life and this course: With the exception of the Independent Assignments, which will receive a full letter grade reduction for each day late, all other missed assignments will receive no credit. As many of the assignments in the course are team-based and completed in class, it is impossible to schedule make-up opportunities for missed assignments. Since there will be occasions in your life when missing a class meeting or missing a deadline for an assignment is simply unavoidable (i.e. illness; personal crisis), this course has a couple built-in safety valves. These are your tools to use in managing your life, please manage these carefully and be careful not to waste your safety valves early in the semester, because you may need your droppable grades to offset any unforeseen low scores or difficulties later in the semester:

Safety Valve One: Out of your 4 RAT grades the lowest 1 will be dropped (individual and team component)

Safety Valve Two: Out of your 4 Unit Test grades the lowest 1 will be dropped

Safety Valve Three: Out of the 14 weekly team task grades the lowest 2 will be dropped

Safety Valve Four: Out of the 11 Independent Assignments 1 will be dropped

Requirement: Passing a rational numbers examination. Every student must take and pass a rational numbers test with no less than a 70% by the drop date for the current semester. Each student may take the examination at most three times during the semester. If a student does not pass the examination on the third attempt or by the last day of March or October, depending on the semester within which the student is taking the course, will receive an "F" in the course. Your first examination will be in class; whereas, the second two examinations, if needed, will be taken out of class at a time agreed upon by both the student and instructor.

VIII. General Course Information:

Faculty Contact Info: Liza Cope, Ph.D., Broom Hall 282, 662-846-4512, lcope@deltastate.edu

Office Hours: Monday, Wednesday, and Friday 8:00-12:00

Library: Requirements for courses include activities, projects, and/or papers where use of the University library is essential. Library hours are posted on the university website. The Instructional Resource Center in the library houses important materials useful specifically for education majors. Library resources are also available online. DSU students may secure access information by visiting the DSU Roberts-LaForge Library.

Class Attendance: Prompt and regular attendance is necessary for success in this course. Any student that exceeds 2 absences without verifiable excuses will receive a lowered participation grade. A student is allowed a maximum of 4 absences. Any person exceeding this number will receive a semester grade of "F."

Lateness-Tardiness Policy: If you need to arrive late or leave early and thereby miss part or all of an in-class assignment, you will receive no credit for the assignment, neither for individual work nor for the work of your team in your absence.

Course Deadlines: Failure to meet deadlines will result in a grade penalty on all assignments in this course. All assignment deadlines are indicated on the syllabus and will be announced in class. Failure to submit an acceptable portfolio will result in failure of this course. The final course shell will be due on the day of the Final Examination.

Examinations: Students are expected to take tests and examinations at the scheduled times. Should a conflict arise, the student should contact the instructor prior to the date of the test to make arrangements for taking the test or exam. The student will have three class days to make up any missed test after returning to school.

Cheating and Plagiarism: Cheating and plagiarism will not be tolerated. University policy will be followed, according to current catalog issues, and procedures specific to the Division will be enforced consistently across programs. These procedures will be disseminated and explained at the beginning of the semester.

Accountability for Individual Work: Unless otherwise directed, all papers and assignments are to represent the individual student's efforts. Students submitting a personal assignment that represents the collaborative works of others or the work of another individual will not be given credit for the assignment. If the offense constitutes cheating or plagiarism, university policy will be followed.

Bibliography: Appropriate sections of secondary mathematics textbooks, portions of *Principles and Standards for School Mathematics*, *Common Core State Standards*, and other books used throughout the semester. Appropriate articles from current periodicals such as *Mathematics Teacher* will be used throughout the semester. Resources: Ewing 222, IRC, Internet, and Roberts-LaForge Library.

IX. Disabilities Statement and Policy: It is the responsibility of students who have professionally diagnosed disabilities to notify the instructor so that necessary and/or appropriate modifications can be made to meet any special learning needs. Students are also directed to contact the Disability Director for the University who will coordinate the accommodations process.

This course uses WILEY PLUS to register for the course first copy and paste <http://edugen.wileyplus.com/edugen/class/cls366603/> into your browser. Next, verify that the section matches your schedule before you register. Finally, log in or create a new ID.

Need Help? View a video: www.wileyplus.com/register or LIVE CHAT! Technical Support: www.wileyplus.com/support
