COVER SHEET
Mathematics Education
National Council of Teachers of Mathematics

Please include one copy of this cover sheet with each program report.

Submitted by: ____The University of Utah_____
(Name of University)

_____Salt Lake City, Utah_____
(Address)

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Date of On-site visit: September 2004

Name of program offered for review in this document: Mathematics Teaching Major

Classification:
_____ Administration
_____ Pre-School/Pre-K
_____ Kindergarten
_____ Early Childhood
_____ Combined (specify): _____
_____
_____ Support Services
__X____Other (specify): Secondary Licensure

Level(s) offered for review in this document:
___X___ Baccalaureate
_____ Post-Baccalaureate, Initial Program
_____ Masters, Initial Program
_____ Advanced Masters
_____ Specialist
_____ Doctorate
_____ Other (specify): _____

Check levels of mathematics teaching programs offered for initial licensure:

_____K-4 teachers with mathematics emphasis or area of concentration in mathematics
_____5-8 mathematics teachers
__X _____7-12 mathematics teachers

Checklist of materials to be enclosed with his program review:

__X___Overview and scope for each program, including the following:

- Explanation of the knowledge base, philosophy for preparation, and goals and objectives of each program
- Candidate course of studies, organized by discipline, with course prefix, number, title, and number of credit hours, and with all courses clearly marked.
- Description of field experiences, student teaching, and internships for all programs. Include the amount of time and type of supervision.
- Explanation of how the program may deviate from the program standards.
- Description of where the program is located within the professional educational unit and its interrelationships with other programs in the unit and the university/college.
- List of faculty with primary assignments in the mathematics program. Provide rank, responsibilities, and tenure status. **(Do not send vitae.)**

- Number of graduates from the program at different levels over the past three years.

__X__Narratives for all appropriate levels.

__X__Matrix/Matrices for all appropriate levels.

X__Syllabi for all courses listed on the matrix

I verify that he information provided in this program review document is accurate and true.

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(Signature) (Name: please print)

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MATHEMATICS TEACHING MAJOR: OVERVIEW AND SCOPE

Section 1: Program Objectives and General Description

The Mathematics Teaching Major Program at the University of Utah is designed to prepare mathematics teachers for grades 6-12 who have a sound understanding of the basic themes and principles of mathematics, and an appreciation of these fundamental concepts throughout the secondary mathematics curriculum. The program provides teachers with the pedagogical skills and attitudes needed to encourage children to value mathematics and to have confidence in their ability to use and to understand mathematics. In addition, the program aims to prepare reflective teachers, committed to evaluating their instruction and improving their students' learning, and it addresses the national guidelines for teacher preparation presented in the American Mathematical Society's (AMS), The Mathematical Education of Teachers, and in the National Council of Teachers of Mathematics' (NCTM), Principles and Standards for School Mathematics.

To accomplish these goals and to graduate with a Bachelor's degree as a mathematics teaching major, a student must satisfactorily complete a set of mathematics courses and allied coursework in physics. They must also complete a teaching minor in another field, meet the general education requirements of the university, and complete the secondary licensure program offered through the Department of Teaching and Learning. Students must apply to the secondary licensure program and admission to this program is competitive. Admission is based on GPA, letters of recommendation, and currently the Praxis I Writing Assessment. Beginning in February of 2004, all applicants will also be required to take the Praxis I PPST Assessment in the areas of reading, writing, and mathematics. The courses in the program include lecture courses, courses with practicum experiences in local schools, and a semester of student teaching. (There is a detailed list of all of these courses provided in the next section, p 4.)

Mathematics teaching majors have represented approximately 24% of all mathematics majors during the past three years. As mathematics majors the prospective teachers take the same mathematics courses that all mathematics majors take for approximately the first two years. These courses include: calculus, linear algebra, differential equations, calculus-based probability and statistics, and a two-semester analysis sequence emphasizing proof and mathematical reasoning. In this initial part of the program, the emphasis shifts gradually from developing mathematical techniques and solving problems, to a focus on mathematical theory, structure, and common threads from different areas of mathematics. By developing confidence in their own ability to solve problems and to reason mathematically, the prospective teachers are better prepared to foster these attitudes in their students.

In the next part of their program, mathematics teaching majors take six additional mathematics courses designed specifically for future secondary teachers and that develop applications of mathematics appropriate for secondary schools. These courses focus on algebra, geometry (Euclidean and non-Euclidean), computer technology, history of mathematics, and mathematics methods. The algebra and geometry courses take a more advanced look at the mathematical background of many of the topics the prospective teachers will address in secondary school. To help students appreciate these connections, algebra and geometry practicum courses have been designed that students take concurrently with their mathematics coursework and that require time spent in local secondary schools. The field experiences related to these courses and to the mathematics methods course require 10-12 hours in a secondary school classroom observing and working with secondary students. As the mathematics teaching majors prepare lessons and consider the mathematical thinking of the students they interview, they learn the importance of communicating mathematical ideas clearly and the value of encouraging students to explain their thinking in class discussions and in written work. This opportunity introduces the prospective teachers to the NCTM Standards and to some of the responsibilities of a secondary school mathematics teacher.

Along with the above mathematics courses, the mathematics teaching majors complete the coursework required in the secondary licensure program that culminates in a semester of student teaching. In these courses, the teaching majors focus more exclusively on developing the general background and pedagogical knowledge required for secondary schools teachers. Their pre-cohort areas of study include multicultural education and classroom diversity, teaching disabled students, adolescent development, learning theory, educational application of technology, and

content literacy for diverse learners. During their cohort (last) year in the program, the teacher candidates spend the Fall Semester taking pedagogical coursework that includes the issues of instruction and management, and curriculum and assessment in a diverse society while working part-time with a teacher in a local school. During the Spring Semester, teacher candidates work full-time as a student teacher while also taking a seminar in action research in the classroom. During this period, the teaching majors are engaged in seminars, and in a continual cycle of evaluation and reflection on their teaching with feedback from their cooperating teacher and from their supervisor.

Throughout the program, the teaching majors' growth in mathematical knowledge and in teaching preparation is evaluated based on test scores, project work, portfolio development, and lesson presentations. Students must earn a grade of C or better in each of the required major courses. At the end of the program, students must earn a reasonable score on the GRE subject test in mathematics. (It is important to note here that the GRE subject test is primarily taken by students planning a graduate career in mathematics and that the purpose of this requirement is to establish a minimum level of competence in mathematics on a national scale.) In the past three years the average score for mathematics teaching majors on the GRE has been at least 500 out of 990 points. In addition, during their student teaching semester, students must earn a satisfactory evaluation from both their university teaching supervisor and their site teacher educator for their performance as a student teacher in the classroom. These requirements support the program's goal to graduate students who are well prepared to teach mathematics in secondary school.

In recent years several steps have been taken to examine the effectiveness of the Mathematics Teaching Major Program. The Mathematics Department holds exit interviews (Appendix III, pp 88) for all graduating mathematics majors. These interviews are voluntary and are used to help determine improvements in the mathematics major program that will benefit the students. In addition, the mathematics teaching majors are surveyed at the end of their student teaching program (Appendix II, p 87) to determine those aspects of their mathematics method and practicum courses that the students found to be most helpful in the classroom. Finally, the Teaching and Learning department requires graduates of the secondary licensure program to take part in an exit interview. The information gained from all of these sources is used in an on-going evaluation of the effectiveness of the Mathematics Teaching Major Program at the University of Utah.

In addition to the Mathematics Teaching Major Program, the University of Utah offers a mathematics teaching minor program as well as a program for elementary teaching majors who would like to earn a level two endorsement in mathematics along with their elementary teaching licensure. Although this document addresses the Mathematics Teaching Major Program in detail, a summary of the mathematics teaching minor and the level two endorsement in mathematics for elementary teaching majors is provided in Appendix I, p 86.

Section 2: Summary of Required Courses

The following is the suggested schedule for the mathematics and physics courses required in the mathematics teaching major program (total of 46-50 credit hours depending on the calculus sequence chosen). Students must earn a grade of C or better in the mathematics courses and a grade of C- or better in the required physics course.

Year	Fall Semester	Spring Semester
1	Math 1210*, Calculus I, pp 18	Math 1220*, Calculus II, pp 18 Math 2160, Intro. To Scientific Computing, pp 27; Physics 2210, Physics for Sci/Engs
2	Math 2210, Calculus III, pp 18 Math 2270, Linear Alg., pp 29	Math 2280, Diff. Equations, pp 29 Math 3210, Found. Analysis I, pp 46 Math 3010, History of Math, pp 34 (or spring of 3rd year)

3	Math 3220, Found. Analysis II, pp 46 One of: Math 3100, Found. Geom., pp 39 *and* Math 3105, Geom. Practicum, pp 43 Or Math 4030, Found Alg., pp 50 *and* Math 4035, Alg. Practicum, p55	Math 3070, Applied Statistics I, pp 36 One of: Math 3100, Found.Geom., pp 39 *and* Math 3105, Geom. Practicum, pp 43 or Math 4030, Found Alg., pp 50 *and* Math 4035, Alg. Practicum, pp 55
4	Math 4090, Math Methods for Secondary School Teachers, pp 59	

*Students with AP Calculus grades of 3 or better may receive credit for some of these courses or may enroll in Math 1250 /1260, a more advanced calculus sequence.

While the teaching majors are fulfilling their mathematics requirements and the requirements for their teaching minor (approximately 24 credits), they are also completing some of the courses required in the secondary licensure program. These are divided into pre-cohort courses (24 credit hours), and cohort courses (21 credit hours), which include the student teaching experience. To be admitted to the licensure program, students must have completed at least eight courses in their teaching major and minor as well as eight education courses prior to their application to the program. Moreover, all of the pre-cohort course work must be completed before the final year of the program. These courses are listed below.

Pre-Cohort Courses (24 credits)
TL 2100, Introduction to Teaching
One of: Ethnic Studies 2550/2560/2570/2580/2590
Adolescent Development, PSYCH 1230, PSYCH 3220, FCS 5230, ED PS 5/6050
ECS 4150, Introduction to Multicultural Education
One of: ED PS 2110, Learning and Literacy; TL 3700, Knowing and Learning in Science and Math
SP ED 5/6011, Teaching Students with Disabilities in General Ed. Settings
TL 5141, Educational Applications of Technology-grades 6-12, pp 64
TL 5/6126, Content Literacy for Diverse Learners
Cohort Courses (Fall Semester, 9 credits)
TL 5/6410, Curriculum and assessment in a Diverse Society, pp 69
TL 5/6411, Instruction and Management in a Diverse Society, pp 73
TL 5/6490, Field Practicum: Secondary, pp 77

Cohort Courses (Spring Semester, 12 credits)
TL 5/6491, Action Research Seminar: Secondary, pp 80; TL 5/6495, Student Teaching: Secondary, pp 83

Section 3: Field Experiences and Student Teaching Supervision

Students in the mathematics teaching major program take part in a number of integrated field experiences in their mathematics and mathematics methods courses that lead into and support the student teaching during the final cohort year. The goal of all of these school experiences is to help preservice teachers connect their university studies to classroom practice and to current research on mathematics education in secondary school. A particular goal is to help the prospective teachers develop a framework for reflection on their teaching and their students' learning that will be a source of professional growth.

In their algebra and geometry courses, generally taken in the third year, the teaching majors study, from a more mature point of view, many of the topics they will teach in secondary school. During this time they also take the algebra and geometry practicum courses, which draw the students' attention to related concepts in the secondary

school curriculum and require 4-6 hours in a local secondary school. Here the teaching majors observe lessons and interview students on topics from algebra and/or geometry. The mathematics methods course takes a broad look at the secondary mathematics curriculum, relating the topics considered to the NCTM Principles and Standards and to research on current issues in mathematics education. In this course the teaching majors spend 6 hours in a secondary school working with students at three different levels. They prepare lesson and unit plans, present and critique lessons at university, and present lessons in the secondary school. In each of these three courses, the teaching majors' work in the school is the subject of class discussions, written assignments, and reflections on the subject of the mathematical thinking and learning of secondary students. Although these field experiences take place prior to the student teaching year and there is no formal teaching supervisor, the goal of this work is to introduce the students to the activities and professional responsibilities of a secondary school teacher prior to the student teaching year.

In the cohort year or final year of their program, the teaching majors teach under the guidance of a classroom teacher and a university supervisor employed by the Department of Teaching and Learning. Student teaching assignments are located in a group of specially selected schools in which teacher candidates observe and practice teaching methods. Student teaching placements are arranged by the cohort leader in consultation with the teacher candidate and the school personnel. The teaching majors begin their cohort year in August before the beginning of the public school year and they are involved in a start-of-the-public-school year experience. In the fall semester the students are either in education classes or in the public schools from 7:30 am to 10:30 am, Monday through Friday. In the spring semester, over a 10-12 week period, the students begin to assume the responsibilities of a regular classroom teacher and are at the school from 7am to 4pm. The last three weeks of the spring semester are spent in full-time closing cohort activities and assignments.

During the cohort year the teaching majors work with their university supervisor and site teacher to develop their skills as a secondary school teacher. The university supervisor has the following duties: 1) conduct formal and informal observations of teacher candidates; 2) conference with teacher candidates to provide guidance, feedback, and assistance; 3) communicate regularly with site teacher educators; 4) complete midterm and final evaluations of teacher candidates' performance. During the 10-12 week student teaching period, university supervisors complete a minimum of three informal evaluations and three formal student teaching evaluations. Informal evaluations include unplanned, touch-base visits designed to update supervisors on the progress of preservice teachers. These informal visits may take 30-45 minutes and often involve a review and discussion of lesson plans. "Drop-in" observations may also take place when a supervisor provides written feedback, a discussion of progress, or other activities designed to review teaching (e.g., e-mail or phone correspondence). Formal visits or observations involve a deliberate pre-conference, the observation of a full lesson (the duration of which will vary according to grade level and content area), and a post-conference. The average length of time for a formal visit by the supervisor would be between 90 minutes and two hours. Each student teacher is visited by the supervisor at least six times during the student teaching experience.

In addition, two evaluation reports are submitted by the university for each teacher candidate. The first is a Formative Evaluation report that summarizes the progress of the teacher candidate after initial informal and formal observations have taken place. This report identifies strengths and areas in need of development. The second report is a Summative Evaluation report at the end of the cohort year. Both of these reports are based on formal meetings between the university supervisor, the site teacher educator, and the teacher candidate.

Section 4: Deviations from the National Council of Accreditation of Teacher Education Recommendations and Guidelines of the Utah State Office of Education

We believe the mathematics teaching major program at the University of Utah meets or exceeds these recommendations and guidelines. We regularly review the State Office of Education guidelines. Upon graduation our mathematics teaching majors are certified as secondary school teachers with a major in mathematics.

Section 5: Location of the Mathematics Teaching Major Program within the Educational Unit

The teaching major program is the joint responsibility of the Department of Teaching and Learning, which oversees the secondary licensure program for all teaching majors, and the Department of Mathematics, which oversees the mathematics course requirements for mathematics teaching majors. Both departments report to the University Advisory Council on Teacher Education on matters involving teacher preparation.

Section 6: Faculty Involved in the Mathematics Teaching Major Program

The list of faculty involved in the Mathematics Teaching Major program is organized first by department and then by the mathematics and education courses required in the program.

Department of Mathematics

Math 1210, 1220, 2210 (Calculus I, II, III)
Steve Gersten, Professor, (tenured); Ken Golden, Professor, (tenured); Hugo Rossi, Professor, (tenured); Klaus Schmitt, Professor, (tenured); Peter Alfeld, Professor (tenured)

Math 2160 (Introduction to Scientific Computing)
Dragan Milicic, Professor, (tenured)

Math 2270, 2280 (Linear Algebra - Differential Equations)
Aaron Bertram, Professor (tenured); David Dobson, Professor (tenured);
Nick Korevaar, Professor (tenured); Jesse Ratzkin, Assistant Professor/Lecturer (non-tenure track); Andrejs Treibergs, Professor, (tenured); Nat Smale, Professor, (tenured): Peter Trombi, Professor, (tenured);

Math 3010 (History of Mathematics)
Jim Carlson, Professor (tenured); Fletcher Gross, Professor (tenured); Klaus Schmitt, Professor (tenured)

Math 3070 (Applied Statistics I)
Robert Brooks, Professor, (tenured); Lajos Horvath, Professor, (tenured); Davar Khoshnevisan, Professor, (tenured); David Mason, Professor, (tenured): Anne Roberts, Professor/Lecturer, (non-tenure track); Andrejs Treibergs, Professor, (tenured)

Math 3100 (Foundations of Geometry)
Aaron Bertram, Professor (tenured); Fletcher Gross, Professor (tenured); Domingo Toledo, Professor (tenured)

Math 3105 (Geometry Practicum)
Marilyn Keir, Associate Instructor (non-tenure track)

Math 3210, 3220 (Foundations of Analysis I, II)
Misha Kapovich, Professor, (tenured); Grisha Mikhalkin, Associate Professor, (tenured); Anne Roberts, Professor/Lecturer (non-tenure track); Nat Smale, Professor, (tenured): Joe Taylor, Professor, (tenured)

Math 4030 (Foundations of Algebra)
Aaron Bertram, Professor (tenured); Fletcher Gross, Professor (tenured); Christopher Hacon, Assistant Professor (tenure-track)

Math 4035 (Algebra Practicum)
Marilyn Keir, Associate Instructor (non-tenure track); Ruth Ann Stefanussen, Associate Instructor (non-tenure track)

Math 4090 (Mathematics Methods for Secondary School)
Marilyn Keir, Associate Instructor (non-tenure track)

Department of Teaching and Learning

T&L 5/6410 (Educational Applications of Technology)
Colleen Kennedy, Professor (tenured), Lisa Yamagata-Lynch, Assistant Professor (tenure-track)

T&L 5/6410 (Curriculum and Assessment in a Diverse Society)
Nancy Ares, Assistant Professor (tenure-track); Mary D. Burbank, Clinical Instructor (non-tenured); Don Kauchak, Professor (tenured); John Settlage, Associate Professor (tenure-track); Nancy Winitzky, Associate Professor (tenured)

T&L 5/6411 (Instruction and Management in a Diverse Society)
Angela Battaglia, Clinical Instructor (non-tenure track); Mary D. Burbank, Clinical Instructor (non-tenure track); Barbara Kuehl, Clinical Instructor (non-tenure track)

T&L 5/6490 (Field Practicum: Secondary)
Angela Battaglia, Clinical Instructor (non-tenure track); Mary D. Burbank, Clinical Instructor (non-tenure track); Barbara Kuehl, Clinical Instructor (non-tenure track)

T&L 5/6491 (Action Research/Seminar: Secondary)
Angela Battaglia, Clinical Instructor (non-tenure track); Mary D. Burbank, Clinical Instructor (non-tenure track); Barbara Kuehl, Clinical Instructor (non-tenure track)

T&L 5/6495 (Student Teaching: Secondary)
Angela Battaglia, Clinical Instructor (non-tenure track); Mary D. Burbank, Clinical Instructor (non-tenure track); Barbara Kuehl, Clinical Instructor (non-tenure track)

Section 7: Mathematics Teaching Major Graduates during from Fall Semester 1999 through Summer Semester 2002

Academic Year	Approved for graduation by the Mathematics Department	Recommended for Secondary Teaching Licensure
1999-2000	12	10
2000-2001	8	7
2001-2002	8	8

OUTCOMES
MATHEMATICS IN INITIAL PROGRAMS FOR
7-12 MATHEMATICS TEACHERS

A high school background of 4 years of mathematics, including the equivalent of precalculus, is assumed. The equivalent of a college major in mathematics should provide for the successful completion of the outcomes listed below.

Please list the mathematics requirements, including the course number and title, for prospective teachers preparing to teach mathematics in grades 7-12.

	Course Number	Course Title	No. of Hours
1.	Math 1210_____	Calculus I (Differential Calculus)_____	_____4_____
2.	Math 1220_____	Calculus II (Integral Calculus)_____	_____4_____
3.	Math 2160_____	Introduction to Scientific Computing____	_____ 3_____
4.	Math 2210_____	Calculus III (Multivariable Calculus)____	_____3_____
5.	Math 2270_____	Linear Algebra_____	_____ 4_____
6.	Math 2280_____	Differential Equations_____	_____ 4_____
7.	Math 3010_____	History of Mathematics_____	_____ 3_____
8.	Math 3070_____	Applied Statistics, I_____	_____4_____
9.	Math 3100_____	Foundations of Geometry_____	_____ 3_____
10.	Math 3210_____	Foundations of Analysis, I _____	_____ 3_____
11.	Math 3220_____	Foundations of Analysis, II _____	_____3_____
12.	Math 4030_____	Foundations of Algebra_____	_____3_____

Please list the mathematics methods requirements, including the course number and title, for teacher candidates preparing to teach mathematics in grades 7-12.

Course Number	Course Title	No. of Hours
Math 3105 & 4035__	Geometry Practicum & Algebra Practicum_	_____2_____
Math 4090___	Teaching of Secondary School Mathematics_	_____3_____

Mathematics Preparation

The Four Themes: Problem Solving, Reasoning, Communication, and Connections are four overriding themes that should permeate all mathematics programs. Although these four areas are inherently interrelated, for the purpose of this review you are asked to explicate how each of these areas is incorporated into your teach preparation program.

1.1 Problem solving: Submit a narrative that describes how the requirements of your program provide opportunities for your candidates to mature in their problem solving abilities.

Narrative on Problem-Solving

Solving problems is central to doing Mathematics. The mathematics teaching majors at the University of Utah are exposed to different perspectives on problem-solving from their beginning calculus courses through their upper division mathematics and math methods courses.

In the first half of their program all teaching majors study the basic concepts of differentiation, integration, linear transformations, and probability and statistics. One goal at this point is to develop a sound understanding of these concepts upon which to build mathematically. But another equally important goal is to develop skill in using these particular concepts and techniques to examine a variety of practical questions that come from many different areas. For instance, the students might use the derivative to determine what production level will maximize profit, they might use the logistic equation to study population growth in a certain environment, or use matrices to describe the movement and scaling of figures in three-dimensional space and the impact on the surface area and volume of these figures. During this part of their program, the teaching majors make extensive use of the computer as a problem-solving tool through computer projects in linear algebra and differential equations, use of the programming language C to solve a variety of problems from different branches of mathematics, and they work with real data sets using the SAS statistical software.

As they move into upper division courses, the teaching majors look at problem-solving in a different context. In their abstract algebra, analysis, and geometry courses, the problems to consider are now those that arise in abstract mathematical thinking. The teaching majors focus their attention on developing a careful understanding of definitions and theorems, the nature and methods of proof, and an appreciation of the structure of mathematical systems. In their history of mathematics course, this study of mathematical systems continues as the students examine historical problems that have led to the further development of mathematics. Finally, in the mathematics methods and practicum courses, the teaching majors consider ways to help students develop problem-solving skills, paying attention to various strategies and their use in particular contexts and grade levels through the lessons they design.

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1.2 Reasoning: Submit a narrative that describes how the requirements of your program provide opportunities for your candidates to make and evaluate mathematical conjectures and arguments, and to validate their own mathematical thinking.

Narrative on Reasoning

Developing skill in mathematical reasoning is a long-term process that is fundamental in understanding mathematics. It involves not only the ability to analyze and to provide proofs in a formal sense, but includes as well, the inclination to look for patterns, to develop examples as a way to understand definitions, and to make and examine conjectures. In their beginning mathematics courses at the University of Utah, the teaching majors are asked to examine definitions carefully by providing examples that meet or fail to meet the conditions specified. They are asked to consider the role played by a specific hypothesis in the conclusion of a theorem. For example, in calculus as they learn that a continuous function on a closed interval has a maximum on that interval, they consider

if this is still true on an open interval, and if not, why it is no longer true. Gradually through examples and counter-examples they come to appreciate the need for careful arguments and proofs.

Although at first the students are presented with rationales for the results they study, over time they are exposed to simple but rigorous proofs, and are encouraged to develop their own arguments. This approach deepens in their upper-division foundation courses, first in their analysis course and then in the algebra, and geometry courses. In their analysis course the students return to one-dimensional calculus, a familiar topic, but now with the emphasis on involving students in a discussion of the theory behind the results they have used. Here for example, students considering the definitions of open and closed sets on the real line make conjectures about the nature of complements, unions, and intersections of open or closed sets. Working in class and through homework, students are asked to present careful arguments defending their conclusions. Then, as students continue on to new topics in their algebra and geometry courses, they continue to develop their mathematical reasoning skills by examining algebraic systems and non-Euclidean geometry. Finally, in their mathematics methods and practicum courses, the teaching majors consider the types of questions, assignments, and classroom projects that will encourage secondary school children to pose questions about mathematics, discuss their thinking, and require them to provide explanations for their conclusions.

1.3 Communication: Submit a narrative that describes how the requirements of your program provide opportunities for your candidates to use both oral and written discourse between teacher and candidates and among candidates to develop and extend candidates' mathematical understanding.

Narrative on Communication

Learning to express ones mathematical ideas is an important goal both as a teacher and as a student. As the mathematics teaching majors move through their program, the emphasis on both written expression and class discussion increases. Satisfactory answers to questions and problems change from numerical answers or algebraic expressions to more detailed descriptions of ideas or methods used to solve problems, apply theorems, or prove conclusions. Although teaching majors expect to explain mathematical ideas to children, over time they come to see that the need to explain their thinking increases their own understanding and helps them become better students themselves.

As students work on computer projects in the linear algebra, differential equations, and scientific computing courses, the need to express ideas in precise language becomes apparent through the interaction with the technology. For example, in writing a program to determine a partial sum of an infinite series, one must define a recursive relationship carefully for the program to run successfully. As students analyze theorems or present proofs in class discussions or on homework, they learn to examine their assumptions and to clarify their statements in response to colleagues' questions or the instructor's feedback on their written assignments. Over time the mathematics teaching majors learn to participate in a mathematical discussion by asking questions, explaining their thinking, and listening to the arguments presented. In their mathematics methods and practicum courses, the prospective teachers work on projects that require them to present verbal and written developments of important mathematical results such as completing the square in algebra, or the Pythagorean Theorem in geometry. Here, as students prepare written reflections on the NCTM Standards, the attention focuses on effective ways that teachers can help students participate in mathematical discussions.

1.4 Connections: Submit a narrative that describes how the requirements of your program provide opportunities for your candidates to demonstrate an understanding of mathematical relationships across disciplines and connections within mathematics.

Narrative on Connections

A rich understanding of a subject requires one to look for connections between different aspects of the subject and to examine contexts in which the subject matter is meaningful or useful. This is just as true in mathematics as in any other subject area. The students in the mathematics teaching major program are challenged to develop these connections in the following ways.

As the teaching majors study calculus, linear algebra and differential equations in the first part of their program, they examine how many of these concepts relate to each other and how they apply in a variety of areas. For example, the method of least squares may be derived in multivariable calculus as an optimization problem and is derived in linear algebra as the solution to a projection problem. In linear algebra students may use least squares to approximate a power law relating human weight to height based on class data. In differential equations they may use the same method to find logistic equation parameters for population predictions. The integrated sequence, linear algebra and differential equations, is explicitly designed so that students can take the linear algebra concepts and apply them to understand the solution spaces for linear systems of differential equations. As students advance in the teaching major program, they develop many connections between their courses. For example, in statistics the students use calculus to study continuous random variables, and the Fundamental Theorem of Calculus to examine the relationship between a probability density function, and the cumulative distribution function. In their algebra course, the teaching majors study the concepts of groups, rings, and fields and use these structures to examine number systems, and the connections between algebraic numbers and geometric constructions. Finally the teaching majors are asked to relate the mathematics they are studying in their own courses to the secondary mathematics curriculum through projects, lesson presentations and school visits during their mathematics methods and practicum courses.

7-12 Outcomes	Evidence: performance data, experiences, courses***** *****Please refer to specific course syllabi for details on performance data, experiences, and assessment
1.5 Programs prepare prospective teachers who can --	
1.5.1 apply concepts of number, number theory, and number systems;	Math 2160, Intro. To Scientific Computing, p 27; Math 3010, History of Math, p 34; Math 4030, Foundations of Algebra, pp 50; Math 4035, Algebra Practicum, pp 55
1.5.2 apply numerical computation and estimation techniques and extend them to algebraic expressions;	Math 1210, 1220, 2210 (Calculus I, II, III), pp 18; Math 2160, Intro. To Scientific Computing, p 27
1.5.3 apply the process of measurement to two- and three-dimensional objects using customary and metric units;	Math 1210, 1220, 2210 (Calculus I, II, III), pp 18; Math 2160, Intro. To Scientific Computing, p 27; Math 2270, Linear Algebra, pp 29
1.5.4 use geometric concepts and relationships to describe and model mathematical ideas and real-world constructs;	Math 2210, Multivariable Calculus, pp 18 ; Math 2270, Linear Algebra, pp 29
1.5.5 understand the major concepts of Euclidean and other geometries;	Math 3100, Foundations of Geometry, pp 39 ; Math 3105, Geometry Practicum, pp 43; Math 3010, History of Math, p 34
1.5.6 use both descriptive and inferential statistics to analyze data, make predictions, and make decisions;	Math 3070, Applied Statistics, pp 36
1.5.7 understand the concepts of random variable, distribution functions, and theoretical versus	Math 3070, Applied Statistics, pp 36

7-12 Outcomes	Evidence: performance data, experiences, courses***** *****Please refer to specific course syllabi for details on performance data, experiences, and assessment
simulated probability and apply them to real-world situations;	
1.5.8 use algebra to describe patterns, relations, and functions and to model and solve problems	Math 2270, Linear Algebra, pp 29 ; Math 2280, Differential Equations, pp 29 ;Math 4030, Foundations of Algebra, pp 50
1.5.9 understand the role of axiomatic systems and proofs in different branches of mathematics, such as algebra and geometry;	Math 3100, Foundations of Geometry, pp 39 Math 3210-20, Foundations of Analysis (I, II), pp 46 Math 4030, Foundations of Algebra, pp 50
1.5.10 have a firm conceptual grasp of limit, continuity, differentiation and integration, and a thorough background in the techniques and application of calculus;	Math 1210, 1220, 2210 (Calculus I, II, III), pp 18; Math 3210-20, Foundations of Analysis, I, II, pp 46
1.5.11 have a knowledge of the concepts and applications of graph theory, recurrence relations, linear programming, difference equations, matrices, and combinatorics;	Math 2270, Linear Algebra, pp 29; Math 3070, Applied Statistics, pp 36
1.5.12 use mathematical modeling to solve problems from fields such as natural sciences, social sciences, business, and engineering;	Math 1210, 1220, 2210 (Calculus I, II, III), pp 18;Math 2270, Linear Algebra, pp 29; Math 2280, Differential Equations, pp 29; Math 3070, Applied Statistics, pp 36
1.5.13 understand and apply the concepts of linear algebra;	Math 2270, Linear Algebra, pp 29; Math 2160, Intro. To Scientific Computing, pp 27
1.5.14 understand and apply the major concepts of abstract algebra;	Math 4030, Foundations of Algebra, pp 50; Math 4035, Algebra Practicum, pp 55
1.6 Programs prepare prospective teachers who have a knowledge of historical development in mathematics that includes the contributions of underrepresented groups and diverse cultures.	Math 3010, History of Math, p 34

Teaching Preparation

Integrated Essential Outcomes

Certain essential outcomes within a program preparing teachers of mathematics are integrated throughout the program. Such outcomes include teaching diverse learners, the appropriate use of technology, and the alignment of assessment and instructional practices.

For each of these outcomes, respond in narrative form describing how candidates attain these outcomes in your mathematics education program. For each outcome: include specific experiences that promote the outcome and describe how you measure its attainment; and describe the process that establishes connections among these experiences. Describe how your program, both in mathematical and pedagogical contents, enables your candidates to gain experience that helps them to achieve this outcome.

2.1 Diverse Learners

Teachers of mathematics use their knowledge of student diversity to affirm and support full participation and continued study of mathematics by all students. This diversity includes gender, culture, ethnicity, socioeconomic background, language, special needs, and mathematical learning styles.

Narrative on Diverse Learners

At the University of Utah, secondary mathematics teaching majors prepare to work with diverse learners and their different mathematical learning styles in three specific ways. First, they learn to value and then to use various approaches to mathematical concepts in order to enhance their own and their students' understanding. Secondly, they consider the historical development of Mathematics with contributions from different cultures. Finally, they examine various classroom strategies to work with children from different backgrounds, making the classroom climate one that allows for, uses, and appreciates the different experiences that children bring to schools.

Throughout their mathematics courses, the mathematics teaching majors examine various approaches to problems and to the development of concepts for the purpose of enriching their own mathematical understanding. For example, in their courses on algebra and geometry the students study the relationship between solutions of polynomial equations and geometric constructions. In probability classes students learn that one can prove the Binomial Theorem with a combinatorial approach in addition to using math induction from an algebraic viewpoints. From these experiences, the students learn that one approach to a concept may seem more accessible at first than another, but they also learn that to develop a sound understanding of a concept, one must look at that concept from different angles.

This emphasis on examining multiple ways to develop and represent concepts is continued in the mathematics methods courses, although now from the point of view of a prospective teacher. In these classes students consider a topic from different mathematical and pedagogical perspectives. Then the students discuss what a child might gain, or lose, with each approach and what the mathematical difficulties might be. For example, students solve quadratic equations using algebra tiles, graphing calculators, tables, graphs, completing the square, the quadratic formula. Afterwards they consider the role of estimation from tables and graphs, what the mathematical and pedagogical difficulties might be in using algebra tiles and graphing calculators, and the use of completing the square and the quadratic formula. Students also are required to present lessons using technology or manipulatives, team-teaching, and using chalk and a blackboard. The goal of the mathematics methods courses is to develop prospective teachers' awareness that there are various ways, both mathematical and pedagogical, to develop mathematical ideas and that these different approaches can make mathematics more accessible to some students and at the same time benefit all students.

Issues of linguistic and cultural diversity are addressed through a number of courses at both the precohort and cohort level. Through their History of Mathematics course, the teaching majors examine some of the contributions to mathematics from the Mayan and Babylonian civilizations, as well as those of western culture leading to the development of the calculus. In addition, at the precohort level, students complete course work through the department of Education, Culture and Society with an emphasis on History, concepts, and theoretical base for multicultural education. Here models and strategies for teaching minority students are considered as students examine criteria for effective curriculum material. The goal in these courses is to prepare teachers who can create a classroom climate that accepts and integrates differences, whether these differences are ability, cultural, linguistic, genetic, or disabling. At the cohort level, students complete course work addressing theories of instruction and management in a diverse society. Course content addresses the needs of linguistically and culturally diverse students within the context of classroom teaching and learning (TL 5411, Instruction and Management in a Diverse Society, pp 73.)

2.2 Technology

Teachers of mathematics use appropriate technology to support the learning of mathematics. This technology includes, but is not limited to, computers and computer software, calculators, interactive television, distance learning, electronic information resources, and a variety of relevant multimedia.

Narrative on Technology

Many aspects of student life at the University of Utah are managed through computers and the internet. As a result, all students quickly learn to use these tools to register for classes, to obtain course information, and to communicate with their instructors. In particular, all mathematics majors use computers in their mathematics courses beginning with the electronic submission of homework in calculus, followed by the use of computer algebra and graphing software in linear algebra, and differential equations, as well as statistical software in their statistical inference courses. For example, using a computer to iterate a linear map in linear algebra, the students find eigenvalues and eigenvectors computationally. At the same time in class they learn how to determine these quantities algebraically and interpret their solutions geometrically. Mathematics students are encouraged to make use of calculators and computers wherever those tools are useful.

Mathematics teaching majors have additional requirements that focus on the use of technology in exploring and teaching mathematics. All prospective teachers spend a semester learning the C programming language to examine interesting mathematical questions from different areas such as the summation of an infinite series, checking primality, and comparing methods of numerical integration. In the mathematics methods/practicum courses, the prospective teachers use two and three-dimensional manipulatives themselves to consider geometric concepts, work with geometric software packages in the computer lab, and develop various programs for a programmable calculator that are related to the secondary mathematics curriculum such as applying Euclid's Algorithm to find the greatest common factor of two natural numbers. In these classes the students discuss the pros and cons of using manipulatives and technology, and consider how these teaching aids can be used to deepen the understanding of mathematical concepts. In addition they present two lessons designed to use either manipulatives or technology to develop a mathematics concept.

In addition, the mathematics teaching majors, along with all teaching majors and minors complete an instructional technology course in the Department of Teaching and Learning which provides an introduction to the use of technology in educational settings (TL 5141, Educational Applications of Technology, pp 64). Instructional uses of technology are explored and tied to current theories of learning to help educators make decisions about how to effectively integrate the use of technology across content areas. Students learn to use a variety of technological applications to support teaching and learning. In addition to the instructional technology course, all teaching majors complete electronic portfolios that align with the professional development requirements of the PRAXIS and INTASC standards.

2.3 Assessment

Teachers of mathematics use formative and summative methods to determine students' understanding of mathematics and to monitor their own teaching effectiveness. Teachers are careful to align their instructional and assessment practices.

Teachers use formative assessment to monitor student learning and to adjust instructional strategies and activities. Formative assessment includes, but is not limited to, questioning strategies, student writing, student products, and student performance.

Teachers use summative assessment to determine student achievement and to evaluate the mathematics program. Summative assessment includes, but is not limited to, teacher-designed tests, criterion-referenced tests, norm-referenced tests, portfolios, projects, and other open-ended student products.

Narrative on Assessment

Prospective teachers need the opportunity to take part in various assessment methods as students in order to become familiar with different methods of assessing learning and to understand what teachers can and cannot determine from the various assessments used. For this reason, in the mathematics methods/practicum courses at the University of Utah students are evaluated based on their work on projects (group and individual), class presentations, class participation, writing assignments that include reflections on their coursework and on the NCTM Principles and Standards, along with a final portfolio (rubric, p 62) in their methods course.

Learning to assess children's mathematical thinking requires time spent observing children in classrooms, listening to student explanations and questions, and then analyzing this discussion with experienced teachers and in the light of current research on the development of mathematical thinking. The mathematics teaching majors spend approximately twelve hours in local secondary school classrooms during their mathematics methods/practicum courses (these courses have a total of 5 semester credit hours). During this time they both observe and present mathematics lessons. Their experiences are the subject of detailed written assignments that require the prospective teacher to examine the experience critically and to consider what the next steps might be in a follow-up lesson or discussion. These assignments become the focus of class discussions that compare the teaching majors experiences and relate their work to required readings on research in mathematics education (Geometry Practicum, pp 43; Algebra Practicum, pp 55; Mathematics Methods, pp 59).

In the fall semester of the cohort year, the mathematics teaching majors meet in designated secondary public schools, Monday - Friday from 7:30 - approximately 10:30 a.m and they also enroll in university courses related to their school experience. The focus of one of the university courses is curriculum and assessment in a diverse society (TL 5410, pp 69). During this period the teaching majors spend a portion of their time conducting fieldwork including observations in major and minor area content classrooms, conducting interviews, teaching mini lessons, and gathering information for portfolio projects. Teacher Candidates are encouraged to spend as much time as possible in classrooms and in discussions with teachers, students, and administrators.

During spring semester student teaching (TL 5495, pp 83) teacher candidates are responsible for all aspects of grading, planning, teaching, and completing administrative responsibilities in each of their three-four courses. In addition to their teaching load, Teacher Candidates complete Teaching and Learning 5491, pp 80, which is a course designed to integrate teacher research into classroom teaching.

7-12 Outcomes		Evidence: performance data, experiences, courses***** *****Please refer to specific course syllabi for details on performance data, experiences, and assessment
2.4	Programs prepare prospective teachers who can identify, teach, and model problem solving in grades 7-12.	Math 2160, p 27; Math 3105, p43 ; Math 4035, p55; Math 4090, p59
2.5	Programs prepare prospective teachers who use a variety of physical and visual materials for exploration and development of mathematical concepts in grades 7-12.	Math 2160, p27; Math 3105, pp 43; Math 4035, pp 55; Math 4090, pp 59
2.6	Programs prepare prospective teachers who use a variety of print and electronic resources.	Math 2160, Intro. To Scientific Computing p 27; Math 3105, Geometry Practicum pp 43; Math 4035, Algebra Practicum, pp 55; Math 4090, Methods of Teaching Sec. Math, pp 59; TL 5141, Educ. Applications of Technology, pp 64
2.7	Programs prepare prospective 7-12 teachers who know when and how to use student groupings such as collaborative groups, cooperative	Math 4090, Methods of Teaching Sec. Math, pp 59; TL 5141, Educ. Applications of Technology, pp 64 TL 5410, Curric. and Assess.in a Diverse Society, pp 69

7-12 Outcomes		Evidence: performance data, experiences, courses***** *****Please refer to specific course syllabi for details on performance data, experiences, and assessment
	learning, and peer teaching.	TL 5411, Theories of Instruction, pp 73
2.8	Programs prepare prospective teachers who use instructional strategies based on current research as well as national, state, and local standards relating to mathematics instruction.	Math 4090, Methods of Teaching Sec. Math, pp 59; TL 5411, Theories of Instruction, pp 73 TL 5491, Action Research, pp 80
2.9	Programs prepare prospective teachers who can work on an interdisciplinary team and in an interdisciplinary environment.	Math 4090, Methods of Teaching Sec. Math, pp 59
2.10	Programs introduce and involve prospective teachers in the professional community of mathematics educators.	Math 4090, Methods of Teaching Secondary Math, p59 TL 5491, Action Research, pp 80
3.0	**FIELD-BASED EXPERIENCES**	
3.1	Programs provide prospective teachers with a sequence of planned opportunities prior to student teaching to observe and participate in 7-12 mathematics classrooms with qualified teachers. Experiences include observing, tutoring, miniteaching, and planning mathematics activities and lessons for different mathematics courses.	Math 3105, Geometry Practicum pp 43 Math 4035, Algebra Practicum, pp 55; TL 5490, Field Practicum Experience, pp 77
3.2	Programs provide prospective teachers with a full-time student teaching experience in 7-12 mathematics that is supervised by a qualified teacher and a university or college supervisor with a 7-12 mathematics teaching experience.	TL 5495, Student Teaching: Secondary, pp 83
3.3	Programs provide prospective teachers with time to confer with the supervising teacher and to do instructional planning.	T&L 5495, Student Teaching: Secondary, pp 83

1 STANDARDIZED SYLLABUS COVER SHEET

Course Number:	**Course Name**:	**Semester/Year**:
Math 1210,1220, 2210	Calculus I, II, III	Fall 2002

Instructor/Professor's Name & Departmental Contact Information (address, phone, e-mail):

Course Coordinator: Hugo Rossi, JWB 210, 585-5875, email: rossi@math.utah.edu

Brief Course Description

Math 1210, Calculus I (4 credits): This course introduces students to the study of calculus and focuses on the following topics: functions and their graphs, differentiation of polynomial, rational and trigonometric functions; velocity and acceleration; geometric applications of the derivative, minimization and maximization problems; the indefinite integral, and an introduction to differential equations; the definite integral and the FundamentalTheorem of Calculus.

Math 1220, Calculus II (4 credits): The topics covered in this second calculus course are: geometric applications of the integral, logarithmic, and exponential functions, techniques of integration, conic sections, improper integrals, numerical approximation techniques; infinite series and power series expansions; differential equations (continued).

Math 2210, Calculus III (3 credits): The third semester of calculus covers the following topics: vectors in the plane and in 3-space, differential calculus in several variables, integration and its applications in several variables, vector fields and line, surface, and volume integrals. Green's and Stokes' theorems.

Alignment with NCATE Program Standards -- Please indicate the Educator Licensure Program Area(s) in which this course is included (e.g. Early Childhood Education, Elementary Education, Secondary Education, Special Education & Early Childhood Special Ed, or various other School Personnel roles). Then, indicate which standards within these licensure programs are met by this course.

Licensure programs in which this course is included: Secondary Licensure

Relevant standard(s) met by course:

NCATE STANDARDS

> Mathematics Preparation: The NCATE Standards addressed are: *Problem-Solving, Reasoning, Communications, Connections*. In particular, the NCATE Matrix 7-12 Outcomes addressed are: 1.5.2 (apply numerical computation and estimations techniques; extend to algebraic expressions), 1.5.3 (apply measurement process to two and three dimensional objects), 1.5.10 (develop firm grasp of concepts, techniques, applications of calculus), 1.5.12 use math modeling)

Candidate Assessment – Indicate how specific candidate knowledge, skills, dispositions, and P-12 student learning are assessed in the course.

Students in these courses are graded based on their work in interactive we-based homework assignments, in-class tests, and a comprehensive written final exam

Mathematics 1210 Calculus I Fall 2002

Instructor. Professor Kenneth M. Golden, LCB 328, 581 - 6176, golden@math.utah.edu

Office Hours. Monday 12:30 pm - 1:30 pm, Wednesday 11:45 am - 12:30 pm, by appointment, or drop by anytime.

Text: *Calculus*, 8th Ed., D. Varberg, E. J. Purcell and S. E. Rigdon

Course Description. Mathematics 1210 is an introduction to differential and integral calculus. Limits, derivatives, and integrals will be developed as tools to analyze the properties of functions. Applications include motion and rates of change, optimization and approximation methods, differential equations, and the calculation of areas, volumes, and lengths.

August	21-23	Handout	Polynomial Calculus	
	26-30			
September	3-6	2.1-2.3	Functions	
	9-13	2.4-2.9	Limits and Continuity	
	16-20	3.1-3.3	Derivatives	EXAM I (Sept. 20)
	23-27	3.4-3.7	Rules for Differentiation	
	30-2	3.8-3.10	Applications of Derivatives	
October	7-11	4.1-4.4	Maxima and Minima	
	14-18	4.6-4.7	Graphing	EXAM II (Oct. 18)
	21-25	9.1	Indeterminate Forms	
	28-1	5.1-5.3	Antiderivatives and Diff. Eqs.	
November	4-8	5.4-5.5	Riemann Sums	
	11-15	5.6-5.7	Fund..Th. of Calculus	EXAM III (Nov. 15)
	18-22	5.8	Definite Integrals	
	25-27	6.1-6.3	Areas and Volumes	
December	2-6	6.4-6.6	Lengths, Work, and Moments	
				FINAL EXAM

Grading Policy. Grades are based on the following: your two best scores on three in-class exams (~ 50%), the final exam (~ 25%), and WeBWorK assignments (~ 25%). You may bring one sheet of paper, and any calculator or computer to any exam. Grades are kept by Eleen Collins, JWB 231, 581-6896, collins@math.utah.edu.

Computers. You are strongly encouraged to use computers to help learn and enhance the material, as well as to solve and check the problems of the course. Maple, Mathematica, and Matlab have many capabilities, such as performing the basic operations of algebra and calculus, and are particularly well suited to visualization and graphics.

Weekly Homework. The assignments below will not be turned in, but you are responsible for knowing how to do the problems. Similar ones will appear on the exams. There will be weekly WeBWorK assignments for which you will receive instructions separately.

Week	Section	Problems
1.	Handout	Problem sets 1 and 2
2.	Handout	Problem sets 3, 4 and 5
3.	2.1	#1, 6-8, 10, 11, 13, 15-29 odd, 33, 36, 45
	2.2	#1, 4, 11, 15-25 odd, 26, 29, 31, 35
	2.3	#1, 2, 9, 15-23 odd, 24, 25, 32, 42, 53-55
4.	2.4	#1-19 odd, 29-32, 36, 37, 40, 49, 50
	2.5	#7, 12 (optional)
	2.6	#1-15 odd, 21, 39, 43
	2.7	#1-13 odd
	2.8	#1-43 odd, 49, 50
	2.9	#1-19 odd, 20, 35-38, 43-45, 57
5.	3.1	#1, 3, 7, 9, 13-23 odd, 27-30
	3.2	#1-19 odd, 27, 33-41 odd, 47
	3.3	#1-41 odd, 49, 51, 53, 55, 56, 58, 59
6.	3.4	#1-19 odd, 24
	3.5	#1-21 odd, 33, 35, 39, 42, 43, 46, 47
	3.6	#1-11 odd, 15, 19, 29, 31, 36
	3.7	#1-11 odd, 17, 19, 23, 27, 29, 33, 35, 39
7.	3.8	#1, 3, 5, 9, 11, 13, 17, 23, 29, 35, 46, 47, 49
	3.9	#1, 2, 5, 7, 9, 12, 15, 17, 27
	3.10	#1, 3, 5, 10, 11, 17, 18, 20, 21, 26, 34, 35
8.	4.1	#1-17 odd, 20, 21, 27, 28
	4.2	#1-35 odd, 36
	4.3	#1-19 odd, 20, 22, 29
	4.4	#1, 5, 12, 19, 20, 23, 26, 29
9.	4.6	#1, 5, 7, 9, 11, 17, 23, 28, 33-35, 40, 41, 53
	4.7	#1, 2, 5, 8, 11, 15, 21, 23, 29-32, 46
10.	9.1	#1, 3, 5, 7, 14, 15, 17, 19, 21, 25
11.	5.1	#1-37 odd
	5.2	#1, 3, 5, 7, 11, 17, 21, 25, 28, 36
	5.3	#1-29 odd, 36, 37, 41
12.	5.4	#1, 3, 5, 7, 11, 12, 13, 15, 17, 20, 24
	5.5	#1, 3, 7, 9, 11-13, 17, 19, 21, 22, 24
13.	5.6	#1-27 odd, 30, 33, 35, 37, 39, 40
	5.7	#1-37 odd, 47-52
14.	5.8	#1-53 odd, 59, 61, 65, 66
15.	6.1	#1-21 odd, 29-35 odd
	6.2	#1-25 odd
	6.3	#1-15 odd, 19, 20
16.	6.4	#1-17 odd
	6.5	#1-9 odd, 15, 21, 22
	6.6	#1-13 odd, 25-27

MATHEMATICS 1220-2, CALCULUS II, Fall 2002

Instructor: Hugo Rossi, JWB 210, 585-5875, email: rossi@math.utah.edu
Text: Calculus, by Varberg, Purcell and Rigdon, Prentice-Hall, Eighth edition.

SYLLABUS

Wed	Aug 21	Introduction
Fri	Aug 23	7.1 ,3 The Natural Logarithm and Exponential
Mon	Aug 26	7.4 General Logs and Exp
Tue	Aug 27	Introduction to Webworks
Wed	Aug 28	7.5 Growth and Decay
Fri	Aug 30	7.5 Growth and Decay
Mon	Sep 2	Labor Day
Tue	Sep 3	7.6 1st Order Linear DEs Assignment I closes Tue Sep 3 at 11:59pm
Wed	Sep 4	7.6 1st Order Linear DEs
Fri	Sep 6	7.7 Inverse Trig Functions
Mon	Sep 9	Review
Tue	Sep 10	Review Assignment II closes Tue Sep 10 at 11:59pm
Wed	Sep 11	Exam I: Chapter 7
Fri	Sep 13	8.1 Integration by Substitution
Mon	Sep 16	8.4 Integration by Parts
Tue	Sep 17	Discussion Assignment III closes Tue Sep 17 at 11:59pm
Wed	Sep 18	8.5 Partial Fractions
Fri	Sep 20	Integration Problems
Mon	Sep 23	Review
Tue	Sep 24	Exam II: Chapter 8 Assignment IV closes Tue Sep 24 at 11:59pm
Wed	Sep 25	9.1 L'Hopital's Rule
Fri	Sep 27	9.2 Other Indeterminate Forms
Mon	Sep 30	9.3 Improper Integrals: Infinite Limits
Tue	Oct 1	9.4 Infinite Integrands Assignment V closes Tue Oct 1 at 11:59pm
Wed	Oct 2	Discussion
Fri	Oct 4	Spring Break
Mon	Oct 7	11.1 Taylor Approximation
Tue	Oct 8	10.1 Infinite Sequences
Wed	Oct 9	10.2 Infinite Series Assignment VI closes Tue Oct 8 at 11:59pm
Fri	Oct 11	Discussion
Mon	Oct 14	10.3 The Integral Test
Tue	Oct 15	10.4 Comp Test Assignment VII closes Tue Oct 15 at 11:59pm
Wed	Oct 16	10.4 Other Tests
Fri	Oct 18	10.5 Absolute Convergence

Mon	Oct 21	10.6 Power Series
Tue	Oct 22	Discussion Assignment VIII closes Tue Oct 22 at 11:59pm
Wed	Oct 23	10.7 Operation on Power Series
Fri	Oct 25	10.8 Taylor Series
Mon	Oct 28	Discussion
Tue	Oct 29	Exam III: Ch 9 and 10, Assignment IX closes Tue Oct 29 at 11:59pm
Wed	Oct 30	Survey of Numerical Methods, Chapter 11
Fri	Nov 1	Discussion
Mon	Nov 4	12.1, 12.2 The Parabola, Ellipse, Hyperbola
Tue	Nov 5	12.1, 12.2 The Parabola, Ellipse, Hyperbola
Wed	Nov 6	12.3 String and Optical Properties of Conic Sections
Fri	Nov 8	12.6 Polar Coordinates
Mon	Nov 11	12.7 Graphs of Polar Equations
Tue	Nov 12	Discussion Assignment X closes Tue Nov 12 at 11:59pm
Wed	Nov 13	12.8 Calculus in Polar Coordinates
Fri	Nov 15	Discussion
Mon	Nov 18	Exam IV: Chapter 12
Tue	Nov 19	18.1 Linear Homogeneous Equations Assignment XI closes Tue Nov 19 at 11:59pm
Wed	Nov 20	18.1 Linear Homogeneous Equations
Fri	Nov 22	18.2 Nonhomogeneous Equations
Mon	Nov 25	18.3 Applications of Second Order Equations
Tue	Nov 26	18.3 Applications of Second Order Equations
Wed	Nov 27	Discussion
Fri	Nov 29	Holiday
Mon	Dec 2	Review: Transcendental Functions; Methods of Integration
Tue	Dec 3	Review: Indeterminate Forms and Infinite Series Assignment XII closes Tue Dec 3 at 11:59pm
Wed	Dec 4	Review: Conics, Polar Coordinates, Differential Equations

Final Exam

Department of Mathematics
University of Utah
Syllabus and Tentative Daily Schedule

MATHEMATICS 2210 – CALCULUS III Autumn 2002

- Time and Place: MWF 8:35-9:25, LCB 219
- Instructor: Professor Klaus Schmitt
- Text: Varberg/Purcell/Rigdon: Calculus, 8th Edition, Prentice Hall, 2000.

1 Course Description

We assume that students are familiar with Calulus I and Caluclus II as presented in chapters 1-12 of the text. The present course is based on chapters 13-17 and will closely follow the material presented there. In addition, there will be occasional notes handed out by the instructor. These notes will also be available on the instructor's web-page. One learns mathematics by doing mathematics. One learns to explain mathematics by writing and talking about mathematics. Integral parts of the course will therefore be the following:

- There will be daily homework assignments which are to be completed using WebWork (ww).

  - The WebWork assignments will be posted and the due dates and times of assignments are also given below. Instructions concerning ww will be provided in class.
  - In addition, given below, is a list of practice exercises selected from the text. These exercises are not required to be handed in.

- Students are encouraged to contribute to class discussions and frequently offer questions, their opinions and insights to the class as a whole.

2 Examinations

There will be two one hour examinations (see schedule below) and one final examination on the day scheduled by the University for this class period. The examinations will be offered only on the dates mentioned. Each of the three examinations will be assigned a letter grade (A, A-, etc.).

3 Grading Policy

Final grades will be determined as the weighted average of the grades received on the two mid-term examinations (30% each), the final examination (30%), and the grade received on homework assignments (10%).

4 Use of MAPLE

Certain aspects of the exercises may be done efficiently by using the computer algebra system maple. Generally, this aspect is for experimentation, checking answers or re-doing a hand calculation by another method, to check validity. Computer assist is encouraged.

4.1 Computing Laboratory

The Department has an excellent computing laboratory available for student use. This laboratory is located in the T. B. Rushing Undergraduate Student Center, the structure connecting LCB to JWB (see http://www.math.utah.edu/ugrad/lab/index.html).

5 Help

Students are encouraged to visit with the instructor during scheduled office hours. Another avenue of help is to visit the Department's tutoring center (tutoring is free of charge!) which is also located in the T. B. Rushing Undergraduate Student Center (see http://www.math.utah.edu/ugrad/tutoring.html).

6 Daily Schedule and Examination Dates

Date	Section	Topic
08/21	13.1	Curves in the plane
08/23	13.2	Vectors, WebWork
08/26	13.3	Vectors
08/28	13.4	Calculus and motion
08/30	13.5	Acceleration, curvature
09/02		Labor day
09/04	14.1,14.2	Vectors in space
09/06	14.3	Cross product
09/09	14.4	Curves in space
09/11	14.5	Motion and curvature
09/13	14.6	Surfaces in space
09/16	14.7	Other coordinates
09/18		Discussion and review
09/20	15.1	Functions of several variables
09/23	15.2	Partial derivatives
09/25	15.3	Limits and continuity
09/27	15.4	Differentiation
09/30		Discussion and Review
10/02		Examination #1
10/04		Autumn break
10/07	15.5	Directional derivatives
10/09	15.6	The chain rule
10/11	15.7	Tangent planes, Taylor's theorem
10/14	15.8	Extremum problems
10/16	15.9	Constrained extrema
10/18		Discussion and review
10/21	16.1	Multiple integrals
10/23	16.2	Iterated integrals
10/25	16.3	Planar integrals
10/28	16.4	Polar coordinates and integrals
10/30		Discussion and review
11/01	16.5	Applications
11/04	16.6	Surface area of solids
11/06	16.7	Triple integrals, volume
11/08	16.8	Triple integrals, center of mass
11/11		Discussion and review
11/13		Examination #2
11/15	17.1	Vector ffelds, force ffelds
11/18	17.2	Line integrals, work
11/20	17.3	Independence of path

11/22	17.4	Green's theorem, flux
11/25	17.5	Surface integrals, surface area of solids
11/27		Discussion and review
11/29		Thanksgiving holiday
12/02	17.6	Gauss' theorem
12/04	17.7	Stokes' theorem
12/06		Reading day
12/09		Final Examination 8:00-10:00am

7 Practice Exercises

Date	Section	Exercises
08/21	13.1	5, 10, 23, 27, 32, 33, 47, 50
08/23	13.2	3, 6, 15, 17
08/26	13.3	2, 3b, 4b, 7, 15, 19, 27, 28
08/28	13.4	3, 13, 19, 31, 44
8/30	13.5	5, 16, 33, 37, 46, 49
09/02		Labor day
09/04	14.1,14.2	(14.1)5a, 6, 8b, 12, 32,(14.2)8, 13, 21
09/06	14.3	5, 14, 16, 17
09/09	14.4	3, 9, 17, 24
09/11	14.5	9, 14, 22, 27, 52
09/13	14.6	9, 25, 33
09/16	14.7	3, 11, 21, 37
09/18		Discussion and review
09/20	15.1	5, 7, 15, 40
09/23	15.2	11, 22, 26, 30, 43
09/25	15.3	15, 17, 21, 28
09/27	15.4	8, 11, 19, 22
09/30		Discussion and review
10/02		Examination #1
10/04		Autumn break
10/07	15.5	4, 11, 23, 26
10/09	15.6	9, 15, 17, 20, 32
10/11	15.7	4, 13, 17, 22
10/14	15.8	3, 12, 15, 19, 20
10/16	15.9	9, 10, 15, 1
10/18		Discussion and review
10/21	16.1	3, 15, 23
10/23	16.2	9, 14, 18, 24
10/25	16.3	11, 13, 19, 21, 28
10/28	16.4	3, 9, 13, 19
10/30		Discussion and review
11/01	16.5	5, 7, 11, 13
11/04	16.6	3, 7, 12, 14, 16
11/06	16.7	5, 11, 19, 25
11/08	16.8	3, 5, 7, 12
11/11		Discussion and review
11/13		Examination #2

11/15	17.1	13, 20, 21, 27
11/18	17.2	8, 10, 17, 19, 26
11/20	17.3	2, 13, 21, 24
11/22	17.4	3, 6, 7, 13, 15, 23
11/25	17.5	7, 11, 13, 17b
11/27		Discussion and review
11/29		Thanksgiving holiday
12/02	17.6	1, 5, 11, 13
12/04	17.7	3, 7, 18
12/06		Reading day
12/09		Final Examination 8:00-10:00am

8 Due dates for WebWork assignment sets

Date	Assignment set
09/01	1
09/08	2
09/15	3
09/25	4
10/18	5
11/03	6
11/10	7
11/21	8
12/06	9

2 STANDARDIZED SYLLABUS COVER SHEET

Course Number:	**Course Name**:	**Semester/Year**:
Math 2160	Introduction to Scientific Computing	Spring 2003

Instructor/Professor's Name & Departmental Contact Information (address, phone, e-mail):

Dragan Milicic, LCB 104, 581-5272, email: milicic@math.utah.edu

Brief Course Description

A short introduction to those aspects of C and C++ essential for mathematics, followed by extensive work with mathematics problems in which computation plays an important role. The objective of this class is to use the computer as a tool for thinking about and solving mathematics problems.

Alignment with NCATE Program Standards -- Please indicate the Educator Licensure Program Area(s) in which this course is included (e.g. Early Childhood Education, Elementary Education, Secondary Education, Special Education & Early Childhood Special Ed, or various other School Personnel roles). Then, indicate which standards within these licensure programs are met by this course.

Licensure programs in which this course is included: Secondary Licensure

Relevant standard(s) met by course:

NCATE STANDARDS

Mathematics Preparation: The NCATE Standards addressed are: *Problem-Solving, Reasoning, Communication, Connections*. In particular, the NCATE Matrix 7-12 Outcomes addressed are: 1.5.1 (apply number theory), 1.5.2 (apply numerical computation and estimation), 1.5.12 (use mathematical modeling), 1. 5.13 (use concepts of linear algebra)

Teaching Preparation: The NCATE Standard addressed is: *Technology*. In particular, the NCATE Matrix 7-12 Outcomes addressed are: 2.4 (problem-solving), 2.5 (use various materials to explore mathematics), 2.6 (use a variety of print and electronic resources)

Candidate Assessment – Indicate how specific candidate knowledge, skills, dispositions, and P-12 student learning are assessed in the course.

Students in this course are graded based on their work in five computer assignments during the semester. Each assignment considers a number of mathematical questions to be examined using the C programming language. Students send their solutions to the instructor by email in plain text files containing the source code for their programs.

Mathematics 2160: Introduction to Scientific Computing (with C)

The objective of this class is to learn to use the computer as a tool for thinking about and solving mathematics problems. We will use the C programming language. The programming notions will be discussed as they are needed in mathematics applications.

The following mathematical topics will be covered:

- _ summation of infinite series;
- _ elementary number theory (checking primality, factorization, Euclid's algorithm);
- _ finding zeros of functions (bisection method, Newton's method); numerical integration (Riemann sums, trapezoid method, Simpson's method);
- _ matrices and linear algebra (solving linear systems - Cramer's rule, Gauss elimination, finding inverses, calculation of determinants);
- _ various geometric problems (as illustrations of using structures and functions in C).

There will be five assignments during the semester in regular intervals. They will be posted on the web page. You will have two weeks to work on your solutions and e-mail them to me. Your grade will be based on your work in solving these five assignments. E-mail the solutions of your assignments to milicic@ math.utah.edu. The solutions should be plain text files containing source code of your programs and your explanation. Any format supported by the lab machines is acceptible. If you use your home computer be sure that the messages are not in some proprietary encoding which is unreadable on unix systems in the lab. I'll refuse to accept such solutions. If in doubt check with me in the lab.

Note to students who want to use their personal computers: If you are using linux operating system, it comes with a C compiler (GNU gcc), so you are ready to go. If you are using some flavor of Windows, I know of two C compiler packages which are freely available on the internet: djgpp (a port of GNU gcc to windows) and lcc. I didn't install or use any of these since I do not use Windows, hence you are on your own.

Texts: B.W. Kernighan, D.M. Ritchie, The C Programming Language, Prentice Hall, Second Edition, 1988.

3 STANDARDIZED SYLLABUS COVER SHEET

Course Number:	**Course Name**:	**Semester/Year**:
Math 2270-80	Linear Algebra; Differential Equations	Fall 2002

Instructor/Professor's Name & Departmental Contact Information (address, phone, e-mail):

Course Coordinator: Nick Korevaar, LCB 204, 581-7318, email: korevaar@math.utah.edu

Brief Course Description

Math 2270-80 (8 credits) is a year-long sequence of courses devoted to linear mathematics. The first semester is a course about linear algebra and the second semester is an introduction to ordinary and partial differential equations. Students in the course sequence are expected to learn the theoretical framework of the mathematics being discussed as well as the practical computational methods which results from the theory. Throughout the sequence students complete computer lab projects using Maple (or equivalent software) both for computational and visualization purposes.

Math 2270 (4 credits):The topics covered in this course include: Euclidean space, linear systems, Gaussian elimination, determinants, inverses, vector spaces, linear transformations, quadratic forms, least squares and linear programming, eigenvalues and eigenvectors, diagonalization

Math 2280 (4 credits): The topics covered in this course include: linear and nonlinear differential equations and systems of equations, with applications. Matrix exponential, fundamental solution matrix, phase-space and portraits, stability, initial- and boundary-value problems, introduction to partial differential equations.

Alignment with NCATE Program Standards -- Please indicate the Educator Licensure Program Area(s) in which this course is included (e.g. Early Childhood Education, Elementary Education, Secondary Education, Special Education & Early Childhood Special Ed, or various other School Personnel roles). Then, indicate which standards within these licensure programs are met by this course.

Licensure programs in which this course is included: Secondary Licensure

Relevant standard(s) met by course:

NCATE STANDARDS

> Mathematics Preparation: The NCATE Standards addressed are: *Problem-Solving, Reasoning, Communications, Connections.* In particular, the NCATE Matrix 7-12 Outcomes addressed are: 1.5.3 (apply measurement process to two,, three dimensional objects), 1.5.4 (use geometric concepts and relationships to describe and model math concepts and real-world constructs), 1.5.8 (use algebra to model and solve problems), 1.5.11 (use linear programming, matrices), 1.5.12 (use math modeling to solve problems from different fields), 1.5.13 (understand and apply concepts of linear algebra)

Candidate Assessment – Indicate how specific candidate knowledge, skills, dispositions, and P-12 student learning are assessed in the course.

Students in these courses are graded based on their work in extensive computer projects, in-class tests, and comprehensive final exams.

MATHEMATICS 2270-2, Syllabus, Fall Semester 2002
Linear Algebra

Text: *Linear Algebra with Applications*, second edition, by Otto Bretscher
When/Where: MW, 16:30-18:30, WEB 617
Instructor: Prof. Mikhail Kapovich
Office: JWB 303; **phone**: 581-7916; **Email** : kapovich@math.utah.edu
Office hours: MW 12-12:50 p.m or by appointment
Course web page: http://www.math.utah.edu/~kapovich/teaching11.html

Prerequisites: Math 1210-1220, or Math 1250-12, first year Calculus. Previous exposure to vectors, either in a multivariable Calculus course (e.g. 2210 or 1260) or in a Physics course, is helpful but not essential.

Sections of the Textbook to be covered:
Chapters 1-8. We will cover one section in 1-2 hours.

Exams: There will be a comprehensive examination and two (1.5 hour long) midterm exams.
Exam 1: October 9.
Exam 2: November 25.
Final Exam: Monday, December 9, 18:00-20:00 in NS 201..

Overview: This is the first semester in a year-long sequence devoted to linear mathematics. Our topic this semester is linear algebra, a fundamental area of mathematics that is used to describe and study a multitude of subjects in science and life. The origins of this field go back to the algebra which one must solve to find the intersection of two lines in a plane, or of several planes in space, or more generally the solution set of one or more simultaneous "linear" equations involving several variables.

We are trying a new text this year which seems more dynamic than the one we used previously. It is our intention to cover chapters 1-8. The detailed syllabus which follows the course summary below is an educated guess at how we will proceed, although the only things for certain are the exam dates.

The course begins in chapter 1 by studying linear systems of equations and the Gauss-Jordan method for systematically solving them. Linear algebra always has a "linear geometric" interpretation, and we begin studying the linear geometry of the Euclidean plane in chapter 2, as well as the relation between inverse matrices and inverse transformations. In chapter 3 we undertake a more systematic exploration of the linear geometry related to transformations and subspaces of R^n.

The relatively concrete concepts for subspaces of R^n which we discuss in chapter 3, concepts including span, independence, basis, dimension and coordinates, actually apply to many other spaces, called "vector spaces" or " linear spaces" . These generalized notions have many common applications to seemingly diverse areas of mathematics, including the study of differential equations in Math 2280. So, in chapter 4 we study these notions abstractly.

You know what it means for two directions to be perpendicular, and may already have used the "dot product" to test for this condition. This notion of " orthogonality" is a major theme of linear algebra, and is the focus of chapter 5. We will study orthogonal projections and transformations, Gram-Schmidt orthogonalization, methods of least squares, notions of orthogonality for functions, Fourier series.

You have probably used determinants as a computational tool in high school algebra, but are probably not aware of all their uses and why their magic properties work. We will study determinants in detail in chapter 6, including their important geometric meaning related to oriented areas and volumes.

Related to the geometry of linear transformations there are special vectors known as eigenvectors. They also arise in the study of dynamical systems and in differential equations. These are the topics of chapter 7. In chapter 8 we will see some initial applications of eigenvectors, related to conic sections, quadric surfaces, and the multivariable second derivative test. In Math 2280 you will see many more applications.

Computer projects: There will be approximately 3 computer projects during the semester, to enhance and expand upon the material in t he text. They will be written in the software package MAPLE. At the moment it is unclear where our MAPLE class will meet: at first we will try Math. Undergraduate Computer Lab, this is where we meet on Monday, Sept. 16 at our regular time. If this does not work out we will move to South Physics building, room 205. This building lies just north of the Math Department building JWB. Two more MAPLE classes will be held on: October 14 and November 27.We do not assume you have had any previous experience with this software and we will make the necessary introductions during the first visit to the lab.

Tutoring center: The Math Department Tutoring Center is located in Mines 210, and is open for free tutoring from 8 a.m. to 8 p.m. on M-Th, and from 8 a.m to 2 p.m. on Friday. Some, but not all of the math tutors welcome questions from Math 2270 students. To see the times and specialities of various tutors, consult the web address www.math.utah.edu/ugrad/tutoring.html .

Grading: There will be two midterms, a comprehensive final examination, and homework. (Home- work assignments and other course information will be posted on the course web page.) Each midterm will count for 20% of your grade, homework (including book and Maple assignments) will count for 30%, and the final exam will make up the remaining 30%. The book homework will be (typically) assigned on Wednesdays and collected one week later. Maple projects will generally be due two weeks after they are assigned. If you are away on the day an assignment is due, you can send it to me by fax.. Math department fax number is 581-4148.. Put your name as well as *my name and the class number* on the fax sheet..

A homework grader will grade your assignments. The value of carefully working homework problems is that mathematics (like anything) must be practiced and experienced to be learned.

ADA Statement: The American with Disabilities Act requires that reasonable accommodations be provided for students with physical, sensory, cognitive, systemic, learning, and psychiatric disabilities. Please contact me at the beginning of the semester to discuss any such accommodations for the course.

Ask questions both during class, after class if I have time, by email and during office hours!

There will be no classes on Monday, September 2nd (Labor Day).

MATHEMATICS 2280-2, Introduction to Differential Equations
SYLLABUS, Spring semester 2001

Text: *Differential Equations and Boundary Value Problems, Computing and Modeling.* second edition by C.Henry Edwards and David E. Penney
When: MTWF 12:55-1:45
Where: JTB 320

Instructor: Prof. Nick Korevaar
Office: JWB 218
Telephone: 581-7318
Email: korevaar@math.utah.edu
Office hours: M 2-2:50 p.m., T 10:00-11:50 a.m., W 2-2:50 p.m., Th TBA.

Course home page: www.math.utah.edu/~korevaar/2280spring01.html

Pprerequisites: Math 2270, and either of 1260 or 2210 (multivariable Calculus).

Course outline: This course is an introduction to ordinary and partial differential equations, and how they are used to model problems arising in engineering and science. It is the second semester of the year long sequence 2270-2280, which is an in-depth introduction to linear mathematics. The linear algebra which you learned in Math 2270 will provide a surprising amount of the framework for our discussions in Math 2280, although this will not be apparent at first.

The semester begins with first order differential equations: their origins, geometric meaning (slope fields) , analytic and numerical solutions, in Chapters 1-2. The logistic equation and various velocity and acceleration models are studied closely. The next topic area, in Chapter 3, is linear DE's of higher order, with the principal application being mechanical vibrations (friction, forced oscillations, resonance). At this point in the course we show how models of more complicated dynamical systems lead to first and second order systems of differential equations (Chapter 4), and study Euler's method for numerical solutions to help understand existence and uniqueness of solutions. We use eigenvalues and eigenvectors, matrix exponentials and general vector space theory, to explicitly solve these problems in Chapter 5. The concepts of phase plane, stability, periodic orbits and dynamical-system chaos are introduced with various ecological and mechanical models, in Chapter 6. The study of ordinary differential equations concludes with an introduction to the Laplace transform, in Chapter 7.
The final portion of Math 2280 is an introduction to the classical partial differential equations: the heat, wave and Laplace equations, and to the use of Fourier series and separation of variable ideas to solve these equations in special cases. This material is covered in Chapter 9 of the text. Time permitting, we may also introduce the Fourier transform.

Coursework: Naturally, you will benefit by attending class regularly and by reading the text. Homework assigned from the book will be collected each week, on Fridays, and a large proportion of the problems will be graded. You will know which problems will be collected on Friday by Tuesday of the same week, at the latest. We will arrange a problem session time on Thursdays, for those of you who would like to have a place to discuss the homework together and/or with me. Of course I am also available during office hours, or if necessary =by appointment. You should also be aware of the Math tutoring center in Mines 210, see www.math.utah.edu/ugrad/tutoring.html for more information.

In addition to standard homework we will do a number (5-7) of projects, using Maple extensively. The projects will be posted on our web page and you will have at least a week's warning before each one is to begin. You will generally have between one and two weeks to complete each project. The subject of differential equations is

driven by its applications, and we will have many interesting possibilities to choose our projects from, including logistic population models, The Tacoma Narrows bridge revisited, numerical methods of solving differential equations, earthquake shaken buildings, chaos in dynamical systems, Fourier series, partial differential equation solutions. Our Math department has a strong research group working on numerical simulation of the human heart muscle, and certain aspects of the muscle excitation process can be explained using Chapter 6 techniques. I hope to convince some of our experts to help develop a lecture/project module related to this material, for our class.

There will be two in-class midterms (closed book, scientific calculator only), as well as a final exam with the same constraints. The dates are as follows:

Exam 1: Wednesday February 14. Probable course material is chapters 1-4.
Exam 2: Wednesday April 4. Probable course material is chapters 5-7.
Final Exam: Wednesday May 2, 11:30 a.m. -1:30 p.m. in class. The exam will cover the entire course. This is the University-scheduled time.

Grading: Each midterm will count for 20% of your grade, the book homework and the projects will count for a total of 30%, and the final exam will make up the remaining 30% of your grade. The value of carefully working the homework problems and projects is that mathematics (like anything) must be practiced and experienced to really be learned.

It is the Math Department policy, and mine as well, to grant any withdrawal request until the University deadline of Friday March 2.

ADA statement: The American with Disabilities Act requires that reasonable accommodations be provided for students with physical, sensory, cognitive, systemic, learning, and psychiatric disabilities. Please contact me at the beginning of the semester to discuss any such accommodations for the course.

4 STANDARDIZED SYLLABUS COVER SHEET

Course Number:	**Course Name**:	**Semester/Year**:
Math 3010	History of Mathematics	Summer 2002

Instructor/Professor's Name & Departmental Contact Information (address, phone, e-mail):

Fletcher Gross, JWB 322, 581-7121, email: gross@math.utah.edu

Brief Course Description

A brief look at the history of mathematics, focusing on the principal ideas of importance in the development of the subject.

Alignment with NCATE Program Standards -- Please indicate the Educator Licensure Program Area(s) in which this course is included (e.g. Early Childhood Education, Elementary Education, Secondary Education, Special Education & Early Childhood Special Ed, or various other School Personnel roles). Then, indicate which standards within these licensure programs are met by this course.

Licensure programs in which this course is included: Secondary Licensure

Relevant standard(s) met by course:

NCATE STANDARDS

Mathematics Preparation:The NCATE Standards addressed are: *Communication, Connections*. In particular, the NCATE Matrix 7-12 Outcomes addressed are: 1.5.12 (use mathematical modeling in natural sciences). 1.6 (knowledge of historical development in math)

Teaching Preparation: The NCATE Standard addressed is: *Diverse Learners*. In particular, the NCATE Matrix 7-12 Outcome addressed is: 2.1 (mathematical contributions from various cultures)

Candidate Assessment – Indicate how specific candidate knowledge, skills, dispositions, and P-12 student learning are assessed in the course.

Students in this course are evaluated based on in-class tests and on a final written project on a topic from the historical development of mathematical ideas.

Mathematics 3010-7, History of Mathematics

Instructor: Fletcher Gross

Text: A History of Mathematics, by Victor Katz and Notes on Kepler's Laws

Tests: There are 3 hour-long tests with about 50% being mathematics questions and the other 50% being essay questions.

Term Paper: In lieu of a final exam, a term paper of about 5-10 pages I required. The subject is to be on a topic with both mathematical and historical aspects. Titles of some recent papers are: *Niels Henrik Abel, Isaac Newton, The History of Non-Euclidean Geometry, The History of the Prime Number Theorem, and The History and Calculation of º.*

Grading: 40% on the term paper and 20% for each test.

Topics:

1. Early Number Systems (Egyptian fractions, Babylonian System, Mayan System)

2. Greek Mathematics (emphasis on proof, axiomatic systems, Euclidean Geometry, parallel postulate and non-Euclidean geometries)

Number Theory (Euclidean Algorithm, Diophantine equations, Pythagorean triples, congruence)

4. Polynomials (Euclidean Algorithm, solution of cubic and quartic equations, symmetric polynomials

5. Kepler's Laws (retrograde motion of the planets, Ptolemaic and Copernican explanations, facts about ellipses, reference to Kepler's laws and the moons of Mars in Gulliver's Travels, Newton's laws of motion, proof of Kepler's laws)

5 STANDARDIZED SYLLABUS COVER SHEET

Course Number:	**Course Name**:	**Semester/Year**:
Math 3070	Applied Statistics, I	Fall 2002

Instructor/Professor's Name & Departmental Contact Information (address, phone, e-mail):

Coordinator: Davar Khoshnevisan, JWB 102, 581-3896, email: davar@math.utah.edu

Brief Course Description

This course provides an introduction to basic probability theory, sampling from normal populations, large-sample problems, sampling from one or two populations, estimation, and testing. Students examine both the theory behind statistical decision making and the application of these techniques to problems from many different areas. Students use the SAS software to perform statistical analyses and the course involves three lectures and one 1 1/2 hour lab per week.

Alignment with NCATE Program Standards

Licensure programs in which this course is included: Secondary Licensure

Relevant standard(s) met by course:

NCATE STANDARDS

> Mathematics Preparation: The NCATE Standards addressed are *Problem-Solving, Reasoning, Communicatio*n, and *Connections*. In particular, the NCATE Matrix 7-12 Outcomes addressed are: 1.5.6 (use statistics to analyze data, make predictions, make decisions), 1.5.7 (examine concepts of random variable, distribution functions, theoretical vs simulated probability and apply them to real-world situations)

Candidate Assessment – Indicate how specific candidate knowledge, skills, dispositions, and P-12 student learning are assessed in the course.

Students are graded in this course based on a combination of in-class quizzes, tests, computer lab projects, and a comprehensive final exam.

Math 3070-1 Applied Statistical I, Fall 2002

Instructor: Professor P. Mendez , LCB 124, 581-8647, mendez@math.utah.edu.

Prerequisite: Calculus (Math 1210, or Math 1215, or Math 1250)

Text: 1) *Statistics and Data Analysis from elementary to intermediate* by A. C. Tamhane and D. D. Dunlop .
2) *Learning SAS in the computer lab* by R. J. Elliot.

Lectures: M WF 9:40-10:30 am, BEH. S. 114. Students are responsible for all material covered in class. Students are expected to attend each class period and to bring their text and calculator.

Computer Lab: All students must attend a two hour lab session on Thursdays. The first lab meets on August 22.

Course purpose : This course is the first in a sequence of two that offer a comprehensive introduction to the concepts of probability and statistics. In this course we will study how to collect and analyzes data for the purpose of drawing conclusions about a Population. The use of data to make estimates about a population depends on the notion of probability. We will study the basic laws of probability, random variables and its distributions, and the Central Limit Theorem. Finally we will develop the basic techniques of inference statistics, point estimates, interval estimation, and hypothesis testing. In the course students will examine both the theory behind statistical decision-making and the practical application of these techniques to problems from many diferent areas; so that students can appreciate the use of statistics in both their personal and professional lives.

The course material will be based on chapters 1-9 of the text and lab assignments in the lab manual indicated above.

Tutoring Center: Free tutoring is available in the math tutoring center located in the new Rushing Student Center (adjacent to LCB and JWB).

Office hours: Mondays 8:30-9:30 am, Fridays 8:30-9:30 am and 10:30-11:30 am, and by appointment (send an e-mail).

Grading: Based on lab grade (10%), quizzes (20%), two midterm exams (20% each), and a final exam (30%).

Lab grade: Students must pass the lab to pass the course.

Homework: Homework problems will be assigned, but they won't be collected. It is absolutely essential to keep up with the homework assignments. The concepts of probability and statistics build on each other. Failure to do homework will most likely result in a lower grade than desired.

Quizzes: There will be a quiz every Friday. These quizzes will be in the form of short ten-minutes quizzes during class or longer take-home quizzes due on Mondays. Quizzes will be based on the homework material and class discussions and will be announced on Wednesdays. The in-class quizzes being short will not be of the same level of dificulty as the class tests. In computing the quiz average, the lowest two scores will be dropped. **No makeups will be given on quizzes.**

Exams: There will be two in class test and a two-hour final exam which will be comprehensive. The only acceptable reason to miss an exam is illness, in which case you will need a note from your doctor. You must contact me or the Mathematics department office (581-6851) **BEFORE** class, otherwise you will receive an E in the exam. The tentative exam schedule is as follows, if any changes have to be made, they will be announced in class a week prior to the test.

Exam 1: Chapter 1, 2, 3, 4. Sep 20
Exam 2: Chapters 5, 6, 7. Nov 6
Final: Chapters 1-9, Tuesday, December 10, from 8:00 am to 10:00 am.

Withdrawals: Please note that the last day to withdraw form class is Friday, October 18, 2002.

Students with a Disability: The American with Disabilities Act requires that reasonable accommodations be provided for students with physical, sensory, cognitive, systemic, learning, and psychiatric disabilities. A student who wishes to request such accommodations needs to contact the Center for Disable Students Services in Room 160 Union, this must be done before special consideration will be given in the class.

Tentative schedule of lectures

Monday	Wednesday	Friday	Monday	Wednesday	Friday
	Aug 21 Chapter 1	Aug 23 Chapter 2	Aug 26 Chapter 2	Aug 28 Chapter 2	Aug 30 Chapter 2
Sep 2 Holiday	Sep 4 Chapter 2	Sep 6 Chapter 2	Sep 9 Chapter 2	Sep 11 Chapter 2	Sep 13 Chapter 2
Sep 16 Chapter 3	Sep 16 Review	Sep 20 Exam	Sep 23 Chapter 4	Sep 25 Chapter 4	Sep 27 Chapter 4
Sep 30 Chapter 5	Oct 2 Chapter 5	Oct 4	Oct 7 Chapter 5	Oct 9 Chapter 5	Oct 11 Chapter 5-6
Oct 14 Chapter 6	Oct 16 Chapter 6	Oct 18 Chapter 6	Oct 21 Chapter 6	Oct 23 Chapter 6	Oct 25 Chapter 7
Oct 28 Chapter 7	Oct 30 Chapter 7	Nov 1 Chapter 7	Nov 4 Review	Nov 6 Exam	Nov 8 Chapter 8
Nov 11 Chapter 8	Nov 13 Chapter 8-9	Nov 15 Chapters 9	Nov 18 Chapters 9	Nov 20 Chapters 9	Nov 22 Chapters 9
Nov 25 Chapter 9	Nov 27 Chapter 9	Nov 29 Holiday	Dec 2 Review	Dec 4 Review	Dec 6

6 STANDARDIZED SYLLABUS COVER SHEET

Course Number:	**Course Name**:	**Semester/Year**:
Math 3100	Foundations of Geometry	Fall 2001

Instructor/Professor's Name & Departmental Contact Information (address, phone, e-mail):

Domingo Toledo, JWB 333, 581-7824, email: toledo@math.utah.edu

Brief Course Description

This course provides a modern axiomatic development of Euclidean geometry and of trigonometry, and also covers incidence theorems, projective invariants, straightedge and compass constructions, and an introduction to spherical and hyperbolic geometries.

Alignment with NCATE Program Standards -- Please indicate the Educator Licensure Program Area(s) in which this course is included (e.g. Early Childhood Education, Elementary Education, Secondary Education, Special Education & Early Childhood Special Ed, or various other School Personnel roles). Then, indicate which standards within these licensure programs are met by this course.

Licensure programs in which this course is included: Secondary Licensure

Relevant standard(s) met by course:

NCATE STANDARDS

> Mathematics Preparation:The NCATE Standards addressed are: *Problem-Solving, Reasoning, Communication, and Connections*. In particular, the NCATE Matrix 7-12 Outcomes addressed are: 1.5.5 (understand the major concepts of Euclidean and other geometries), 1.5.9 (understand the role of axiomatic systems and proofs)

Candidate Assessment – Indicate how specific candidate knowledge, skills, dispositions, and P-12 student learning are assessed in the course.

Students in this course are evaluated based on in-class quizzes, tests and on a comprehensive final exam.

MATH 3100: Foundations of Geometry

TIME AND PLACE: M, W, F 2:00 - 2:50 in JWB 333.

INSTRUCTOR: Domingo Toledo
Office: JWB 324, Tel 581-7824,
toledo@math.utah.edu
Office Hours: Mon, Wed 1:00 - 1:50, Tue 11:50-12:40, or by appointment.

TEXTBOOK: Clemens and Clemens, *Geometry for the Classroom*.

COURSE DESCRIPTION: This is a basic course in Geometry. Most of the semester we will follow the textbook of Clemens and Clemens. The textbook is divided into intuitive sections (I), construction sections (C), and proof sections (P). For each topic we will first cover the intuitive sections to get quickly to some interesting material, then proceed to constructions and proofs. Towards the end of the semester I expect to cover more detailed material on spherical and hyperbolic geometry that is not in the textbook.

HOMEWORK AND QUIZZES: Every day or so I will assign homework problems. These are to be worked on schedule, but not to be handed in. Most Wednesdays, beginning August 29, as in the attached schedule, I will give a 20 minute quiz on the homework on material discussed by the previous Monday. Please make sure that you can do all the homework problems, and get all the help you need: ask questions in class, or during office hours. There is a solutions manual for the exercises, and copies are on reserve in the Math Library and the Marriott Library. It is strongly suggested that the solution manual only be used to check solutions that are already worked out, since premature use of the manual obviously defeats the learning objectives of the course.

CALCULATORS, RULER, COMPASS: You will need a scientific calculator to figure out triangles and the values of trigonometric functions. You will also need a good straight-edge and compass for the construction pages of the book.

MIDTERMS: I will give midterm examinations on September 26, October 24, and November 28.

FINAL EXAMINATION: It will be comprehensive, on Monday December 10, 8:00 - 10:00.

COURSE GRADE: The final grade will be based on the following numerical score:

10 quizzes, drop the lowest 3	30%
3 midterms, drop the lowest one	40%
final examination	30%

The letter grade will be assigned, using a scale not stricter than 90-100 A (or A), 80-89 B (+,-), etc.

MAKE-UPS: Since I will drop the three lowest quizzes, and the lowest midterm, there will be no make-ups for the quizzes and midterms

ADA STATEMENT: The Americans with Disabilities Act requires that reasonable accommodations be provided for students with physical, cognitive, systemic, learning, and psychiatric disabilities. Please contact me at the beginning of the quarter to discuss any such accommodations you may require for this course

Math 3100: Tentative Schedule
The following is a tentative schedule for the course. The dates of the quizzes and examinations are fixed, but everything else could change slightly as the semester goes on.

W-F	Aug 22-24	I 1-10	Properties of triangles, Pythagorean theorem.
M-F	Aug 27-31	I 11-21	Parallelism, congruence and similarity
W	Aug 29	Quiz 1	
M	Sep 3	Holiday	
W-F	Sep 5-7	P 1-5, C 1-7	Isometries of the line, constructions
W	Sep 5	Quiz 2	
M-F	Sep 10-14	I 22-25, C 15-21	Circles, inscribed angles, secants and tangents
W	Sep 12	Quiz 3	
M-F	Sep17-21	I 26-30	Sines and cosines, trigonometric identities, triangles
W	Sep 19	Quiz 4	
M	Sep 24	Review	
W	Sep 26	Midterm 1	
F	Sep 28	P 6-7	Motions of the plane
M-W	Oct 1-3	I 31-32	Area formulae, cross-ratio
W	Oct 3	Quiz 5	
F	Oct 5	Holiday	
M-F	Oct 8-12	P 8-10	Groups of symmetries of the plane
W	Oct 10	Quiz 6	
M-F	Oct 15-19	C 8-11	Ruler and compass constructions
W	Oct 17	Quiz 7	
M	Oct 22	Review	
W	Oct 24	Midterm 2	
F	Oct 26	I 33-37	Volume formulae, spheres
M-F	Oct 29-Nov2	I33-37(cont),C22	Volume formulae, Spheres
W	Oct 31	Quiz 8	
M-F	Nov 5-9	I 38-39	Spherical geometry
W	Nov 7	Quiz 9	
M-F	Nov 12-16	P 11-12, C 12-14	Rigid motions in 3 dimensions, regular polyhedra
W	Nov 14	Quiz 10	
M-W	Nov 19-21	I 40, C 23	Hyperbolic geometry
W	Nov 21	No quiz, review	
F	Nov 23	Thanksgiving Holiday	
M	Nov 26	Review	
W	Nov 28	Midterm 3	

F	Nov 30	P 13-17	Hyperbolic geometry (cont), Geometry of 3 dimensions
M	Dec 3	P13-17(cont)	Coordinate geometry of 3 dimensions
W	Dec 5	Review	
F	Dec 8	No class	
M	Dec 10	Final Exam 8:00 - 10:00	

7 STANDARDIZED SYLLABUS COVER SHEET

Course Number:	**Course Name**:	**Semester/Year**:
Math 3105	Geometry Practicum	Summer 2002

Instructor/Professor's Name & Departmental Contact Information (address, phone, e-mail):

Marilyn Keir, JWB 226, 581-3865, email: keir@math.utah.edu

Brief Course Description:
Application of the geometry studied in MATH 3100, Foundation of Geometry, to the secondary-school classroom. One purpose of the course is to help prospective teachers develop an awareness of meaningful ways to teach geometry in 7-12 grades and of the materials available for that purpose. Another purpose is to help students become reflective teachers who will look critically at the materials used, assessments made, and lessons given to better meet student needs.

Alignment with NCATE Program Standards -- Please indicate the Educator Licensure Program Area(s) in which this course is included (e.g. Early Childhood Education, Elementary Education, Secondary Education, Special Education & Early Childhood Special Ed, or various other School Personnel roles). Then, indicate which standards within these licensure programs are met by this course.

Licensure programs in which this course is included: Secondary Licensure

Relevant standard(s) met by course:

NCATE STANDARDS

Mathematics Preparation: The NCATE Standards addressed are *Communicatio*n, and *Connections*. In particular, the NCATE Matrix 7-12 Outcomes addressed are: 1.5.4 (use geometric concepts to model math and real-world constructs), 1.5.9 (understand role of axiomatic systems and proof), 1.6 (knowledge of historical development in geometry)

Teaching Preparation: The NCATE Standards addressed are *Diverse Learners*, *Technology*, *and Assessment*. In particular, the NCATE Matrix 7-12 Outcomes addressed are: 2.4 (develop problem-solving approaches in teaching), 2.5 (use various physical and visual materials to support learning math), 2.6 (use print and electronic services)

PRAXIS STANDARDS

Domain A (1, 3, 4): developing, presenting geometry lessons; examining materials available for teaching geometry; observing and interviewing students on geometry topics in field experiences

Domain C (2,3): class work on essential components lessons designed to develop mathematical concepts and methods of assessing understanding

Domain D (1): critiquing lessons presented; analyzing student interviews

Candidate Assessment – Indicate how specific candidate knowledge, skills, dispositions, and P-12 student learning are assessed in the course. Students are graded in this course based on all of the following: Written assignments on mathematics and pedagogy; Analysis of student interviews/observations in field experiences; Lesson presentations. Class participation; Final portfolio

MATH 3105 – Spring 2003
Foundations of Geometry Practicum

Instructor:
Marilyn Keir
JWB 226
O: 581-3865 H: 521-3749
keir@math.utah.edu

Class Meetings:
Hours: MTW 10:40-12:00 am, W. 2-4 pm,
W. 2-4 pm, T 12:20-2:20 LCB 218

Purpose of the Course:
This is a lab course that will parallel Math 3100 Foundations of geometry. One purpose of this course is to help you develop an awareness of meaningful ways to teach the geometry you are learning in your foundations course to students in the 7th through 12th grades, and an awareness of the materials available to do that. Another purpose of this course is to help you become reflective teachers who can look critically at textbooks, teaching materials, assessments and their own teaching for the purpose of better meeting the needs of students.

Effective teaching is based on an understanding of student learning. Research on learning indicates that students benefit when they have the opportunity to explore mathematical problems in realistic contexts and develop their own understandings of mathematics. Another purpose of this course is to examine what it means to teach in ways that allow for this type of learning.

Readings:

NCTM Standards 2000 – geometry [can be found at http.//standards.nctm.org/document/index.htm]
Flatland by Edwin A. Abbott
Utah State Geometry Core www.usoe.k12.ut.us/curr/

Course Requirements and Grading :

Teaching Topics (15%) You will be asked to teach a geometry topic four or five times during the term. You will be graded on presentation, organization, presence in front of a class, professional demeanor, etc.

Daily Assignments and Class participation (20%) Worksheets and other written class activities will be turned in for credit. They are due at the beginning of class if assigned at home and the end of class if assigned during the class. Your participation in class activities and discussions is important not only for your own learning, but also the learning of others. You are expected to attend class, be on time, and be a collaborative participant in the work of the class. There is a Navigating Through Geometry conference which you will be asked to attend on February 7-8 at Lone Peak High School.

Textbook Lesson Analysis Assignment (20%) You will compare two or three geometry text books analyzing favorable and unfavorable qualities of each.

Portfolio (15%) You will prepare a geometry portfolio for future use. It will contain most of the work done in class. The portfolio will also contain appropriate geometry activities and information you have found in journals and on the internet.

Field Assignments I & II:
Student Interview and Analysis (15%) These will be opportunities for you to examine the mathematical knowledge of young students and explore their thinking.

Teaching Mesa group at Bryant (15%) You will prepare and execute an after school activity for a Wednesday afternoon for 10-15 students at Bryant Intermediate school.
Calendar of events(approximate) for Foundations of Geometry Practicum

DATE TOPIC YOU TEACH

Date	Topic	You Teach	**Assignment due on this day:** Unless otherwise noted
1/7	Van Hiele, Pythagoras		
1/14	Phi, golden ratio	Pythagorean theorem proof or golden ratio activity	A clever unique proof and visual aids to illustrate the theorem or Pythagoras song
1/21	LOGO Meet in math Computer lab		Shape project or parallel project
1/28	Geoboards and Patty papers	Activity on geoboard Or using patty paper.	Design a computer lab activity for logo.
2/4	Tessellations		Triangle centers for acute, obtuse, Right triangles.
2/11	TI-92 calculator		Create your own tessellation
2/18	FLATLAND, polygons		Design a Cabri activity for students due 3/4
2/25	Field Experience		Cooperate on a section of Flatland Newspaper Due 3/11
3/4		Present TI calculator Activity.	Student interview on Pythagorean theorem due 3/4
3/11	Celebrating PI day	Activity on pi (π)	Make a creation for pi day.
3/25	Fractals, symmetry		**Textbook comparison written with a partner due 4/8
4/1		Compass construction Or manipulative or Paperfold activity	Symmetry project or a fractal
4/8	Solids		Create a set of platonic solids (due today)
4/15	Grand finale!	A fun geometry idea	Come in for your portfolio interview during the Week.
4/22			

8 STANDARDIZED SYLLABUS COVER SHEET

Course Number:	**Course Name**:	**Semester/Year**:
Math 3210-20	Foundations of Analysis I, II	Fall 2002

Instructor/Professor's Name & Departmental Contact Information (address, phone, e-mail):

Coordinator: Nat Smale, JWB 223, 581-7921, email: smale@math.utah.edu

Brief Course Description

This sequence of two analysis courses serves two main purposes. First, it is a rigorous introduction to real analysis, and theoretical aspects of calculus, providing a much deeper understanding of topics students have previously studied. The second purpose is to learn how to work logically and vigorously through problems, that is "doing proofs".

Math 3210 (3 credits): This course is a rigorous reconsideration of the real-number system and of continuity and differentiability for functions of one variable. The emphasis is on improving the student's ability to understand and explain concepts in a logical and complete manner.

Math 3220 (3 credits): This course covers advanced multivariable calculus. The topics include continuity, compactness, differentiability and affine approximations, chain rule, Taylor series, extremization, error estimation, inverse and implicit function theorems, Fubini's Theorem, introduction to differential forms and the general Stokes' Theorem, applications to the study of curves and surfaces.

Alignment with NCATE Program Standards

Licensure programs in which this course is included: Secondary Licensure

Relevant standard(s) met by course:

NCATE STANDARDS

> Mathematics Preparation: The NCATE Standards addressed are *Problem-Solving, Reasoning, Communicatio*n, and *Connections*. In particular, the NCATE Matrix 7-12 Outcomes addressed are: 1.5.9 (understand role of axiomatic systems and proof), 1.5.10 (develop a firm grasp of concepts, techniques, applications of calculus)

Candidate Assessment – Indicate how specific candidate knowledge, skills, dispositions, and P-12 student learning are assessed in the course.

Students are graded in this course based on a combination of written homework, in-class tests, and a comprehensive final exam.

Mathematics 3210-3220 Foundations of Analysis I and II
Course Description, 2002-2003

Course Coordinator: Nat Smale, JWB 223, 581-7921, smale@math.utah.edu. Feel free to contact me if you have any questions about the course.

Course Prerequisites: Math 1210 and 1220 (1-variable calculus), 2210 (multivariable calculus) or their equivalents. Many students will have had (or are concurrently taking) Math 2270-2280, which linear algebra and o.d.e.'s. Math 2270, or some linear algebra is required for Math 3220.

Text: For Math 3210: "Elementary Analysis:The Theory of Calculus", by Kenneth A. Ross. For Math 3220: "An Introduction to Analysis" 2nd edition, by William R. Wade.

Course Description: Math 3210-3220 serves two main purposes. First, it provides a rigorous introduction to real analysis, and theoretical aspects of calculus, hopefully giving the students a much deeper understanding of some topics that they have previously studied. The second purpose is to develop skills in mathematical reasoning, and to learn how to work logically and rigorously through problems (i.e. doing "proofs"). This should include developing communication skills. In particular, students should learn how to write out their arguments in a clear, precise and logically correct manner. This will be the first course of this type for many of the students.

Math 3210 covers one variable analysis, which covers most of the text (Ross). This seems to be a little too much for one semester. I would recommend covering the material in the following order: chapters 1, 2, 3, 5, 6. There may not be enough time to cover much of chapter 4, or the optional (starred) sections of the other chapters, although it would be good if the students saw some of the material on uniform convergence. Hopefully, you can get through the Fundamental Theorem of Calculus. When I taught this course three years ago, I started off with a lecture or two on set theory, which "Elementary Analysis". Feel free to do things differently than in the text. For example, some of the main theory in chapter 2 (eg Bolzano-Weierstrass Theorem) can be done without resorting to limsup and liminf (see the corresponding chapter in Wade). Early in the course, the pace should be pretty slow, showing how to solve various problems rigorously. I think that it is important to assign homework pretty regularly (in both 3210 and 3220), and that a good part of the grade be based on this, perhaps 30-50%. I also think that it is important that the homework be graded (at least some of the problems) so that the students get some feedback and direction. Ideally you will have an experienced student for a grader. If not, then you should grade some of the problems yourself.

Math 3220 covers analysis in Euclidean Spaces. This would correspond to part II of the text, though so far, we have only been able to cover chapters 8, 9, 11, and part of 12. Try to cover 8,9, and 11 well; then if you have time proceed with 12 (possibly covering 5.1-5.3, if the students didn't get to this in 3210).

Math 3210 - Foundations of Analysis I - MTWF 8:35 - 9:25 AM, LCB 219

Text *Elementary Analysis: The Theory of Calculus* - Third Edition, by Kenneth A. Ross
Instructor: Joe Taylor, JWB 202, 581-3927

Syllabus
I will lecture two days a week. The other day will be devoted to doing problems from the book in class. I will call on students to go to the board and do the problems. The first problem session will be Friday, Jan 10. There will be 3 midterms and a final exam. I will drop the lowest midterm score for each student. The midterms will determine 40% of your grade, the final exam 40% and your presentation of solutions to homework problems 20%.

Exams:
Jan 31 midterm
Feb 26 midterm
Mar 28 midterm
Apr 28, 8 AM - 10 AM Final Exam

Assignments:
Section problems
1 1, 4, 6, 8a, 11
2 1, 2, 3, 6
3 1, 3, 4, 5, 6
4 1a,b,m,u, 3a,b,m,u, 7, 8, 10, 15
5 1, 2, 5
7 1, 2, 4, 5
8 1, 2a,c,e, 4, 5, 8a, 10
9 1, 2, 3, 4, 8, 9a,b, 14
10 2, 5, 6, 7, 8, 9, 11
11 2, 5, 8, 9, 10
12 2, 3a,b,d,e,g, 4, 7, 8, 11, 14a
14 1a,b,e, 2a,b,e 5, 6, 7, 12
15 1, 3, 6, 7, 8
17 1, 3a,b,f, 4, 5, 6, 9a,b, 10
18 2, 4, 5, 6, 9
19 1a,c,e, 2a,b 4, 6, 7, 8
20 1, 2, 5, 6, 11, 13, 14
23 1a,c,e,g, 3, 5a, 7

Course: Math 3220, MWF 9:40 - 10:30 in JTB 110
Instructor: Domingo Toledo
Office: JWB 324, Tel 581-7824, toledo@math.utah.edu
Office Hours: Mon 10:45 - 11:35, Tue 2:00 - 3:00, Wed 1:00 - 2:00, or by appointment
Textbook: William R. Wade, An Introduction to Analysis, Second Edition

Course Description:
The course will cover chapters 8,9,11 and part of chapter 12 of the textbook. We may also briefly cover some of chapter 10. We will start with Euclidean space in any number of dimensions, discuss the structure of Euclidean space, limits, and what is called the topology of Euclidean space. We will then study continuous functions, then differentiable functions. Finally we will study integration of functions, in as much detail as time permits. The emphasis of the course will be on proofs. Thus the course will serve two purposes: teach you about functions of several variables, and give you more experience in doing proofs. The prerequisite for the course is a rigorous one variable calculus course, such as Math 3210.

Homework:
Each week I will assign homework problems to be handed in the following Wednesday. I will return the problems on Friday, and you will have one opportunity to rework any problems you could not do the first time around by the following Wednesday. Late homework will be considered equivalent to re-worked homework: one opportunity to hand it in by the following Wednesday. Doing the homework is the most important part of the course, please do not hesitate getting any help you need in doing the homework.

Midterm:
I will give two midterms, on September 27 and November 1.

Final examination: Tuesday, December 10, 8:00 - 10:00 AM.

Grading Policy: For each person I will drop the three lowest homework scores and work out a total score based on:

Homework	40%
Midterms	30%
Final	30%

The grading scale will not be any stricter than 10 percentage points per letter grade (90-100 A or A-, 80-90 B or B+ or B-, etc).

9 STANDARDIZED SYLLABUS COVER SHEET

Course Number:	**Course Name**:	**Semester/Year**:
Math 4030	Foundations of Algebra	Spring 2002

Instructor/Professor's Name & Departmental Contact Information (address, phone, e-mail):

Aaron Bertram, JWB 302, 581-6964, email: bertram@math.utah.edu

Brief Course Description

This course introduces students to various algebraic structures in developing the real and complex number systems and generalizing the arithmetic operations to objects other than number. The topics considered include: integers, unique factorization, and modular arithmetic, polynomial rings, and connections between algebra and geometry.

Alignment with NCATE Program Standards

Licensure programs in which this course is included: Secondary Licensure

Relevant standard(s) met by course:

NCATE STANDARDS

> Mathematics Preparation: The NCATE Standards addressed are *Problem-Solving, Reasoning, Communicatio*n, and *Connections*. In particular, the NCATE Matrix 7-12 Outcomes addressed are: 1.5.1 (apply concepts of number, number theory, number systems). 1.5.8 (use algebra to describe patterns, relations, functions, to model and solve problems), 1.5.9 (understand the role of axiomatic systems and proofs), 1.5.14 (understand and apply the major concepts of abstract algebra)

Candidate Assessment – Indicate how specific candidate knowledge, skills, dispositions, and P-12 student learning are assessed in the course.

Students are graded in this course based on in class quizzes, tests, and a comprehensive final exam.

Mathematics 4030, Foundations of Algebra, Spring 2002
SYLLABUS

Class meets: MWF 2-2:50 in JTB 320

Instructor: Aaron Bertram **Office:** JWB 305

Email: bertram@math.utah.edu **Phone:** 581-6964

Office Hours: M 1-2, T 12-1

Grading: Grades will be based on weekly quizzes and exams.

Quizzes: Wednesdays, starting the second full week of class. Quizzes will last 20 minutes and will be worth 20 points. Some (but not all!) problems will come from the homework. Only the top 10 quiz scores will be counted.

Midterms: Two midterms, worth 100 points each.
1st Midterm: Friday, Feb 1.
2nd Midterm: Friday, April 5.

Homework: Homework will be assigned Wednesdays, and \quizzable" on the following Wednesday. They will not be collected.

Final Exam: Worth 200 points. Thursday, May 9, 1-3 PM

Totals: 200 + 200 + 200 = 600 possible points.

Materials: Lecture notes will be distributed each Wednesday, containing the homework assignments and the material to be covered in class. They will also be posted on the web, for your convenience.

Prerequisites: Multi-variable calculus and linear algebra are desirable. If you have not had courses on these subjects recently, please see me.

ADA Statement: The Americans with Disabilities Act requires that reasonable accomodations be provided for students with physical, sensory, cognitive, systemic, learning, and psychiatric disabilities. Please contact me at the beginning of the semester to discuss any such accommodations.

Course Outline: Algebra can be understood as a generalization of the operations of arithmetic (+. -, ×, ÷) to things that aren't numbers. Thus, when we study polynomials and matrices, we are “doing algebra.”In this course, I want to do algebra within the context of trying to understand numbers better. Thus we will begin by talking about number systems, and eventually focus on the huge “gap” between the rational numbers and the complex numbers. Numbers in the gap that are roots of polynomials with rational coefficients are “algebraic” numbers, and we will use matrices to help us analyze the subtle differences that exist among these numbers.

The course is divided into three (interlocking!) parts:

1. A brief tour of number systems:
a. Natural “counting" numbers **N** = {1, 2, 3, … }primes and induction.
b. The ring of integers **Z** = {… , -2, -1, 0, 1, 2, …}
c. The field of rational “fraction’ numbers **Q** = { a/b }

e. The field of real "length" numbers **R**.
f. The field of complex numbers **C**.
g. Number-like systems: Quaternions and clock arithmetic.

2. Polynomials.
a. Long division, factoring and roots.
b. The amazing fundamental theorem of algebra.
c. Quadratic, cubic and quartic formulas.
d. Using an algebraic number to build a new number system.
e Clock arithmetic for polynomials. Why we can't trisect an angle.

3. Matrices.
a. "Groups" of invertible matrices (with examples).
b. When vector spaces are algebras.
c. Some information about the symmetric groups.
d. Galois groups.
e. Why there is no good formula for finding roots of all polynomials.

Course Description: Mathematics 4030, Foundations of Algebra Spring 2002

Introduction. Algebra is about structure. A set, S, has no intrinsic structure, and the only interesting thing we can ask of S is how big it is (is S infinite? if S is finite, how many elements does it have?). There are some subtle differences among sets with infinitely many elements (for example, there are more real numbers than integers), but this is the realm of set theory, not algebra.

As soon as S has some extra structure, then we are in the realm of algebra. I'd like to illustrate this with some basic examples:

Example 1: Groups of Symmetries: An "invertible" n x n matrix, A, is a linear transformation:

$$T : R^n \rightarrow R^n$$

with an inverse. We can detect invertibility by taking the determinant of A (which is a number). We can multiply two invertible matrices to get a third, but we cannot expect the sum of two invertible matrices to be invertible. We should also remember that matrix multication is associative, but may not be commutative. We will say that a subset $G \subseteq \{$ invertible n x n matrices$\}$ is a group of symmetries if G has the following properties:

(i) G is closed under multiplication (if A, B are in G, then AB is in G)
(ii) G is closed under inverses, (if A is in G, then A^{-1} is in G) and
(iii) G contains I_n (this follows from (i) and (ii)).

There are many interesting groups of symmetries. Here's one family:

Cyclic Groups: These are groups of the form:

$$G = \{\ldots, A^{-2}, A^{-1}, A^{-0} = I_n, A^1, A^2, \ldots\}$$

for any matrix A. Now there are two possibilities. Either:
(a) some power of A is I_n (so that the sequence A^1, A^2, A^3 …cycles"), or else
(b) the sequence never cycles.

Note that in case (a) the group G is finite, and in case (b) it is infinite.

Summary: A group of symmetries G is a set with the extra structure of (matrix) multiplication which is associative, but may not be commutative. It always contains the identity matrix I_n and is closed under inverses. A group of symmetries can arise as the set of "symmetries" of something in R^n. For example, take a regular polygon with p sides and center it at the origin in R^2 (with a vertex at (1, 0)). The clockwise rotations of the plane by angles $2k\pi/p$ are symmetries of the polygon. That is, they do not change the position of the polygon. The set of all such rotations is a finite cyclic group (take A to be the rotation by $2\pi/p$)
Thought Exercise: Find a symmetry of a p-gon that isn't a rotation.

Example 2: Vector Spaces: Recall that a vector space is a set of vectors, V, with the extra structure of vector addition (commutative and associative) and scalar multiplication (distributing with vector addition). The full set of rules from linear algebra will be recalled later when we need them.

Example 3: Numbers: The operations of arithmetic:

$$(+, -, x, \div)$$

on numbers give numbers their extra structure. But what do we mean by numbers? We will begin the course by taking a tour of the number systems.

Example 4: Polynomials: Remember that

$$f(x) = a_0 + a_1x + \ldots + a_dx^d$$

is a polynomial with coefficients a_i (always numbers) and one variable x. The operations of arithmetic work on polynomials (their "extra" structure), except that we can only long divide polynomials. Factoring polynomials turns out to be hard (and it is hard for natural numbers, too!). We can think about roots of polynomials (which are numbers). We will be most interested in the roots of polynomials with rational coefficients. Such numbers (which are not usually rational themselves) are called algebraic. Examples include any number produced by the quadratic formula. We will also learn cubic and quartic formulas (dating from the 15th century).

Example 5: Equivalence: This is a very primitive structure on a set. Namely, we say that $\approx$ is an equivalence relation on the elements of S if:

(i) $s \sim s$ always (the reflexive property)
(ii) $s \sim t$ whenever $t \sim s$ (the symmetric property)
(iii) whenever $s \sim t$ and $t \sim u$, then $s \sim u$ (the transitive property)

Some examples of this include: equality (!), the usual relation on fractions:

$$a/b \sim c/d \text{ whenever } ad = bc$$

and relations on natural numbers of the form: $a \sim b$ whenever n divides $b \sim a$

We use such equivalence relations all the time without thinking, like when we look at a clock or add fractions. In this course we will think about them.

One algebraic "structure" can frequently be used to analyze another. Forexample, we learn in linear algebra how to use roots of polynomials to help us analyze matrices by the process:

$A \rightarrow f(\lambda) \rightarrow$ roots of $f(\lambda) \rightarrow$ eigenvectors $\rightarrow$ diagonalization of A

where $f(\lambda)$ is the characteristic polynomial $\det(\lambda I_n - A)$. Thus the roots of characteristic polynomials (also known as eigenvalues) help us to understand matrices by diagonalizing them.

By the end of this course, I want to talk about Galois theory, which in some sense takes the process above and turns it around! It is one of the real gems of modern mathematics, using symmetry groups to help us to analyze algebraic numbers. The process goes in this order: algebraic number $\alpha \rightarrow$ f(x) $\rightarrow$ group of symmetries of the roots of f(x) where f(x) is the smallest polynomial with rational coeffcients and root α.

On the way, I want to also consider:

Induction. An important tool for defining and proving things.
Primes. Natural numbers (or polynomials) with no interesting factors.
Euclid's algorithm. A cool way to find greatest common divisors.
The fundamental theorem of algebra. A property of complex numbers.
Isomorphisms. When two sets + structures are considered the same.
Quotients. Equivalence relations that respect structures.
The Chinese remainder theorem. A property of some quotients.
Symmetric groups. The "biggest" groups of symmetries.
Simple groups. Groups of symmetries with no interesting quotients.
Algebras. Vector spaces with a vector (not just scalar) multiplication.

We will make use of simple ideas from trigonometry, calculus and linear algebra whenever convenient. After all, mathematics is cumulative!

10 STANDARDIZED SYLLABUS COVER SHEET

Course Number:	**Course Name**:	**Semester/Year**:
Math 4035	Algebra Practicum	Spring 2002

Instructor/Professor's Name & Departmental Contact Information (address, phone, e-mail):

Marilyn Keir, JWB 226, 581-3865, email: keir@math.utah.edu

Brief Course Description

Knowledge of mathematics is only one essential prerequisite to good teaching. Teachers must also have the ability to develop mathematical ideas with students of different ability levels and experiences. One purpose of this course is to help students develop an understanding of the central ideas of algebra as they connect to the secondary curriculum.

Alignment with NCATE Program Standards

Licensure programs in which this course is included: Secondary Licensure

Relevant standard(s) met by course:

NCATE STANDARDS

Mathematics Preparation: The NCATE Standards addressed are *Communicatio*n, and *Connections*. In particular, the NCATE Matrix 7-12 Outcomes addressed are: 1.5.8 (use algebra to describe patterns, functions, and to model and solve problems). 1.5.9 (understand role of axiomatic systems and proof), 1.6 (knowledge of historical development in algebra)

Teaching Preparation: The NCATE Standards addressed are *Diverse Learners*, *Technology*, *and Assessment*. In particular, the NCATE Matrix 7-12 Outcomes addressed are: 2.4 (develop problem-solving approaches in teaching), 2.5 (use various physical and visual materials to support learning math), 2.6 (use print and electronic services)

PRAXIS STANDARDS

Domain A (1, 3, 4): developing, presenting algebra lessons; examining materials available for teaching algebra; observing and interviewing students on algebra topics in field experiences

Domain C (2,3): class work on essential components lessons designed to develop mathematical concepts and methods of assessing understanding

Domain D (1): critiquing lessons presented; analyzing student interviews

Candidate Assessment – Indicate how specific candidate knowledge, skills, dispositions, and P-12 student learning are assessed in the course.

Students are graded in this course based on all of the following:Written assignments on mathematics and pedagogy; Analysis of student interviews/observations in field experiences; Lesson presentations
Class participation; Final portfolio

MATH 4035 – Spring 2002

Foundations of Algebra Practicum

Instructor:
Marilyn Keir
JWB 226 Hours:
O: 581-3865 H: 521-3749
keir@math.utah.edu

Class Meetings:
JWB 333 Tuesday, 11:55-1:55

Purpose of the Course:
The assumption underlying this course is that knowledge of mathematics is only one essential prerequisite to good teaching. Good teachers must also have the ability to develop mathematical ideas with 7th through 12th grade students of different ability levels and experiences. One purpose of this course is to help you develop an understanding of the central ideas of algebra as they connect to each other and to the secondary curriculum.

Effective teaching is based on an understanding of student learning. Research on learning indicates that students benefit when they have the opportunity to explore mathematical problems in realistic contexts and develop their own understandings of mathematics. Another purpose of this course is to examine what it means to teach in ways that allow for this type of learning.

Course Requirements And Grading:

Teaching Topics (20%) You will be asked to teach an algebra topic five or six times during the term. You will be graded on presentation, organization, presence in front of a class, professional demeanor, etc.

Daily Assignments and Class participation (30%) Worksheets and other written class activities will be turned in for credit. They are due at the beginning of class the week they are assigned. Your participation in class activities and discussions is important not only for your own learning, but also the learning of others. You are expected to attend class, be on time, and be a collaborative participant in the work of the class.

Textbook Lesson Analysis Assignment (20%) You will explore the treatment of complex numbers in 7th through 12th grade textbooks and materials**.**

Field Assignments I (Student Interview and analysis) & II (Teaching experience at Bryant Intermediate) (15% each) **These will be opportunities for you to examine the mathematical knowledge of young students, explore their thinking, and try some ideas on a small group.**

ADA: The University of Utah seeks to provide equal access to its programs, services and activities for people with disabilities. If you will need accommodations in this class, reasonable prior notice needs to be given to the instructor and to the Center for Disability Services, 162 Olpin Union Building. Call 581-5020 to make arrangements for accommodations. All written information in this course can be made available in alternative format with prior notification.

DATES: Jan. 25, 26: Navigating Through Mathematics conference at Brighton High.
No class during February.

Calendar of events for Foundations of Algebra Practicum

DATE	TOPIC	Assignment due
1/8	Technology in algebra, Multiple representations Of Quadratic Formula	Explore multiple representations of and ways to find solutions to this equation: $x^2=2x+3$ Would it work on these two? $x^2=2x-3$ and $x^2 = 2x-1$
1/15	Pascal's triangle	Presentations on Pascal's triangle Internet research
1/22	Prime Numbers Clock Arithmetic	Presentations on clock arithmetic or prime numbers Mod Art project.
1/29	Field experience (Skyline High or Central)	Interview a student about the understanding of the Quadratic formula, roots, polynomials, etc.
3/5	Euclidean algorithm geometrically	Euclidean Algorithm, Calculator program for primes.
3/12 π-2!	Pi from an algebraic Perspective	Your favorite series to approximate pi…
3/19	Complex numbers	Understanding complex numbers
3/26	Complex numbers, Gaussian Primes	Visit the curriculum library and do a lesson evaluation on complex numbers: (Due 4/2)
4/2	Continued Fractions	Worksheet
4/9	More on the calculator	Presentation using a calculator .
4/16	Polynomials, roots	Presentations about polynomials and families of functions
4/23	Fractals and complex Numbers	Julia program, graphical iteration
4/30	Big ideas	Present a fun algebra trick to impress your friends.

Things you will hand in:

PROGRAMS on calculator	**Worksheets**	**Presentations**
Quadratic formula	Multiple representations	Pascal's triangle
Prime numbers	Euclid's Algorithm	Clock Arithmetic
Euclid's algorithm	Gaussian Primes	Calculator
	Continued Fractions	Family of functions
	Mod Art	Big idea

11 STANDARDIZED SYLLABUS COVER SHEET

Course Number:	**Course Name**:	**Semester/Year**:
Math 4090	Teaching of Secondary School Mathematics	Spring 2003

Instructor/Professor's Name & Departmental Contact Information (address, phone, e-mail):

Marilyn Keir, JWB 226, 581-3865, email: keir@math.utah.edu

Brief Course Description (as described in the U of U catalog):

The purpose of this course is to help students satisfy the following responsibilities of teachers. Learning to teach mathematics in secondary school requires an integrated view of topics in the K12 mathematics curriculum and a clear understanding of the "big ideas" of mathematics. In addition it is necessary to develop skills in curriculum design and implementation such as lesson and unit planning, assessment, the use of technology and other teaching tools and a variety of teaching methods for grades 7-12.

Alignment with NCATE Program Standards Licensure programs in which this course is included:

Relevant standard(s) met by course:

NCATE STANDARDS

Teaching Preparation: The NCATE Standards addressed are *Diverse Learners*, *Technology*, *Assessment*. In particular, the NCATE Matrix 7-12 Outcomes addressed are: 2.4 (develop problem-solving approaches in teaching), 2.5 (use various physical and visual materials to support learning math), 2.6 (use print and electronic services)

PRAXIS STANDARDS

Domain A (1, 3, 4, 5): developing, presenting algebra lessons; examining materials available for teaching algebra; observing and interviewing students on algebra topics in field experiences

Domain C (2, 3): class work on essential components lessons designed to develop mathematical concepts and methods of assessing understanding

Domain D (1, 3): critiquing lessons presented; analyzing student interviews; attending professional meetings; developing familiarity with local and national mathematics standards and research

Candidate Assessment – Indicate how specific candidate knowledge, skills, dispositions, and P-12 student learning are assessed in the course.

Students are graded in this course based on all of the following: Written assignments on mathematics and pedagogy; Analysis of student interviews/observations in field experiences; Lesson presentations
Class participation; Final portfolio

MATH 4090 – Spring 2003
Teaching & Learning Secondary Mathematics

Instructor:

Marilyn Keir
JWB 226 Hours 10:40 – 11:30 or before class
O: 581-3865 H: 521-3749
keir@math.utah.edu

Class Meetings:
M, W 4:30 – 6:00p.m. LCB 323
Final: Mon. April 28, 6-8 p.m.

Purpose of the Course:
Learning to teach mathematics requires an integrated view of topics in the mathematics curriculum from kindergarten through twelfth grade and a clear understanding of the "big ideas' of mathematics. In addition it is necessary to develop skills in curriculum design and implementation such as lesson and unit planning, assessment, the use of technology and other teaching tools and a variety of teaching methods for grades 7 – 12.

Text: MGM: Research Ideas For The Classroom: Middle Grades Mathematics
Standards 2000 : Principals and Standards for School Mathematics www.nctm.org

Reference Materials:
Mathematics Teaching in the Middle School , NCTM
Mathematics Teacher , NCTM
Utah State Core Curriculum www.usoe.k12.ut.us
Addenda Series (in Math Library)
- Geometry From Multiple Perspectives
- Data Analysis & Statistics
- Developing Number Sense
- Understanding Rational Numbers and Proportions
- Patterns and Functions
- Connecting Mathematics
- Geometry in the Middle Grades
- Algebra in a Technological World

Reading List

Required: A graphing calculator: TI-83 plus, TI-86

Course requirements & grading:

Readings and reflections	50 points
Other assigned items (5)	50 points
Student observations write-up(2)	40 points
Formal lesson plans (2)	40 points
Unit Plan	60 points
Lesson presentations (3)	40 points
Portfolio	50 points
Final Exam	100 points
Participation & professional responsibilities (Including CME2 conference)	40 points

Readings And Reflections:
The course is based on the NCTM Standards with a week devoted to each standard. Each Monday we will discuss the readings for that standard and relevant issues from current events and education. Watch the paper and magazines for articles of interest. The attached schedule assigns regular readings that are selected to stimulate your thinking about topics discussed in class and issues relevant to mathematics education today. To prepare for class discussion, you should read the chapters from the text and read the

relevant sections of Standards 2000 . Math readings should be done with paper, pencil and possibly a calculator in hand. Work through the example problems. Spend time thinking and talking with others about your reactions to the ideas and problems presented. Each Monday you will prepare a key question which might be used to discuss the readings. Each Friday you will reflect on what you have learned about that standard and about teaching and learning mathematics during that week. Your reflection for each standard should be a typed page that reflect your thoughts about the readings and the activities in class. It will include some specific ideas for lessons. Do not simply report on the contents of the readings.

Other Assignments :

A. calculator packet
b. An AlgeBrush drawing
c. An assessment tool designed by you
d. Your own creative work of mathematics
e. Design a project for students which includes reading and writing mathematics.
f.

Student Observation and Analysis:

Learning to teach math involves learning about learners, about the conceptions they hold and the processes through which they learn. In order to gain an appreciation of students as learners and thinkers you will need to spend time observing and talking with them. Make arrangements with principals and teachers to observe and talk with a student in three different classrooms – one in a junior high and two in a high school(one calculustrack three mathematical understandings and their attitude towards particular student and respond to the following:

1. Provide student's grade level, school, class size, length of class, time of day and name of the course and a brief description of the class you observed.

2. Describe and evaluate your student's understanding of the particular math topic they are studying in class. What do they understand and what are they confused about? How interested are they in that particular topic?

3. How critically are they thinking about the mathematical activity of the class or the task(s) on which they are working? What factors seem to influence their level of engagement with the mathematics?

4. Characterize the nature of communication that occurs during the math lesson between the students, between the teacher and students. What levels of questions are being asked by the teacher and by the students? Who is doing most of the talking and about what?

5. How does the teacher's instruction impact the student you are observing? How carefully is he or she listening? What about other students? How much help does the student receive from the teacher and from other students?

6. What insights did you gain? If you had to teach this student this particular topic how would you change what happened in the class?

Formal Lesson Plans:

You will prepare two formal lesson plans using ideas learned in the class. These plans should be original and have a minimum of material from other sources. They should be complete enough that other members of the class can use them with ease. Each lesson plan must include course, grade level, length of period and each of the following (as will be further detailed in class):

a. Objectives and procedures
b. Materials necessary

c. Relationship to NCTM Standards and State Core
d. Teaching and questioning strategies
e. Related concepts
g. Tool for assessment (not necessarily a test or quiz)

Unit Plan : (more details will follow)
You will develop a plan to teach a set of about 6 to 8 math lessons on a particular topic. Your unit will include:

a. An overview of the unit that summarizes your goals, rationales and plans for assessment.
b. A content inventory that outlines the mathematical ideas of the unit.
c. A detailed opening lesson plan.
d. Less-detailed lesson plans for 2 more key lessons.
e. A library of lesson ideas that you will draw on for the follow-up lessons.

Lesson Presentations :
You will have three opportunities to teach a lesson to the class. Each time you present you will hand me a brief lesson plan (typed) of what you plan to do which you will hand in before you begin to teach.

a. You will present an activity or technology demonstration (10 minutes.)
b. You will present a five minute chalk talk with no visual aids (5 minutes.)
c. You will be part of a group presenting a topic from the curriculum. (30 minutes per group.)

Other Readings:
You will read one Mathematics Teacher Journal , one Mathematics Teaching in the Middle School Journal and one book from the Addenda series. In addition you will review two general interest math books from the list provided. Ideas from these will be included with the appropriate standard.

Portfolio: You will keep a portfolio for the semester including all of your written work for the class.
More details will follow.

Rubric for 4090 Portfolio

Points	Content:
/20	Required elements Assignments (5) Class notes (10) Reflection on the portfolio (5)
/10	Extras
	Presentation:
/10	Binder, tabs, T of C
/10	Organization and Personality
/ 50	Total

Final Exam :
A final will be given. Questions will focus on the topics discussed in class and general theories of teaching and learning mathematics.

Participation:

Your participation in our class activities and discussions is important not only for your own learning but also the learning of others. You are expected to treat our class as part of your professional experience, that is you are expected to take responsibility for your learning and act in a professional and collegial manner. This includes attending class on time, attending the entire class period, being prepared and being a collaborative participant in the work of the class. You will be expected to attend one outside conference or workshop on February 7,8.

Grading:
Each written assignment will be graded according to this scale:
100% Superior work, well-above basic expectations, very thoughtfully composed, minimal writing errors, on time.
90% Excellent work, above basic expectations, thoughtful, few errors, on time.
80% Good work, as expected, successfully communicated, one day late.
70% Adequate work, Some omissions, Minimal thoughtfulness, unclear or multiple errors, late.
60% Inadequate work, incomplete, not thoughtful, multiple errors, late.

ADA: The University of Utah seeks to provide equal access to its programs, services and activities for people with disabilities. If you will need accommodations in this class, reasonable prior notice needs to be given to the instructor and to the Center for Disability Services, 162 Olpin Union Building, 581-5020 to make arrangements for accommodations.All written information in this course can be made available in alternative format with prior notification.

Important dates: Jan. 15, Drop day; Feb. 28, Withdraw day; February 7, 8, **Navigating Through Geometry Conference** at Lone Peak High School; Monday, Jan. 20 Human Right's day; Monday, Feb. 17 Pres. Day; March 17-20 spring break; Wednesday, April 22, Last day of class

Secondary Math Methods Survey
Name:_____ Home phone:_____ email address:_____
Favorite math symbol:_____ Major:_____ Minor_____

Where did you attend secondary school?

What did you enjoy about math when you took math courses?

What did you not enjoy about math?

Why have you decided to be a teacher of mathematics?

What do you hope to get from this course which will help you in your teaching?

What level of proficiency do you have on the Graphic Calculator?

12 STANDARDIZED SYLLABUS COVER SHEET

Course Number:	**Course Name**:	**Semester/Year**:
TL 5141	Educational Applications of Technology, grades 6-12	Spring 2002

Instructor/Professor's Name & Departmental Contact Information (address, phone, e-mail):

Brief Course Description (as described in the U of U catalog):

Alignment with NCATE Program Standards Licensure programs in which this course is included:

Relevant standard(s) met by course:

NCATE STANDARDS

Teaching Preparation:

PRAXIS STANDARDS

Candidate Assessment– Indicate how specific candidate knowledge, skills, dispositions, and P-12 student learning are assessed in the course.

TL 5141 Course Syllabus
Syllabus
5141 Educational Applications of Technology
Course Web Site Syllabus Assignments Lab Exercises Resources

Course Information
University of Utah-Spring 2002
Wednesday 4:35pm - 7:35 pm Room MBH 109
Office Hours: Arranged upon request
Instructor: Professor Lisa Yamagata-Lynch
Office: MBH 131 Phone: 587-7980
E-mail: Lisa.Yamagata-Lynch@ed.utah.edu

*The University of Utah and the Department of Teaching & Learning seek to provide equal access to its programs, services, and activities for people with disabilities. Reasonable prior notice is needed to arrange accommodations

*Upon discussion with students, the instructor reserves the right to make revisions to the course syllabus

Course Description
Provides an introduction to the use of technology in educational settings. Instructional uses of technology will be explored and tied to current theories of learning to help educators make decisions about how to effectively integrate the use of technology across content areas. Students will learn to use a variety of technological applications to support teaching and learning. For candidates seeking licensure in elementary, early childhood, and special education or with instructor's permission.

Purpose
The purpose of this course is for you to develop an understanding of what it means to be a teacher who integrates technology into the curriculum in order to provide a rich learning experience for students. This course will specifically introduce you to educational principles pertaining to learning, instructional design, and using technology as an educational tool. Additionally, this course will prepare you to become a lifelong learner and to build your own professional development plan as a teacher. I hope that this course will introduce you to different technology resources that will help you become an inquiry-oriented teacher that is aware of the rich learning experiences you can provide to future students. The goal of this course is not for you to become a multimedia software developer. Instead, the goal is for you to become a teacher who integrates technology into your subject area in an educationally sound manner. Additionally, it is likely that the skills and concepts you learn in this course are not currently practiced in many of the Utah schools. However, as a newly hired teacher you may be very well expected to be a leading force in the school change efforts in terms of technology curriculum integration. In order to be prepared for this, you have to be creative, bold, patient, and resourceful.

Objectives
Develop!
- Your understanding of a technology rich learning environment
- Your philosophy of education and acknowledge how this affect your teaching
- A cohort of critical teachers in training with your classmates

Reflect!

- On your curriculum technology integration lesson ideas

Share!

- Your curriculum technology integration lessons

Practice!

- Your decision-making process as a teacher·
- Your interactions from working in a team of interdisciplinary colleagues
- Your beginning as a lifelong learner

Expectations and Requirements

Attendance

You are expected and required to attend all class sessions and arrive on time. This is a labbased course, and a lot of your work for the class is expected to take place during class. Additionally, you are required to participate in group based classroom activities and assignments; therefore, you are not only responsible to yourself to attend classes, but also to your classmates.

Late Assignments

Assignments are expected to be submitted the day that they are due. If you fail to submit your assignment to the instructor you will lose 1 point per day. After your assignment is 3 days late, you will automatically get 0 points for that assignment.

Professionalism

The School of Education is a professional training school. You have made the choice to enroll in the program to be trained as a teacher. Remember that you are in-training to become a professional. Consequently, I expect that you will treat your peers professionally, conduct class presentations professionally, and submit professional quality writing assignments. You will be penalized 1 point per day when an assignment is submitted late. Think of it as if you are attending faculty meetings and submitting reports to your principals. Finally, I expect that you will all become a part of a community of teachers that are critical of each others work and feel comfortable in sharing ideas.

Computer Lab Etiquette

While your instructor, your peer, or guest lecturer is conducting a presentation you are expected to pay complete attention to what they are presenting. It is not only rude, but also distracting to the presenter and other students in class if you are working on the computer during a presentation. If you are engaging in activities such as surfing the web, writing a paper, reading/writing email, and working on class assignments during a presentation you will be asked to leave the class for the day.

Materials

You are required to purchase the course textbook with the CourseCompass access code at the bookstore. Additionally, you are required to purchase a 100MB zip disk to store your assignments.

Electronic Accounts

You are required to sign up for CourseCompass at http://students.pearsoned.com/, and obtain a Network ID at http://nid.utah.edu (if you already have an account, but cannot remember your ID then click on NID Discovery). Detailed instructions for the above will be given in class.

Textbook

Maddux, C. D., Johnston, D. L., & Willis, J. W. (2001). *Educational computing: Learning with tomorrow's technologies* (3rd ed.). MA: Allyn and Bacon.

Assessment, Points, and Grades
Assessment
Through my assessment practices in this course, I will strive to measure personal progress and achievement rather than comparing your performance with your peers'. I will value your effort in challenging your own knowledge by taking initiative in your problem posing and problem solving skills.

Assignment and Total Possible Points
Assignments Points
Lab Attendance/Exercises 20pts
Online Discussions 10pts
Personal Philosophy Statement 20pts
Technology Integration Lesson 10pts
Interview a Technology Coordinator or a Principal 20pts
Web-Based Professional Portfolio 20pts
Total Possible Points 100pts

The above table shows how each assignment would contribute to your total possible points. You must be aware that 100pts is the maximum number of points you can earn for this class, but that does not mean that this is guaranteed simply by turning in your assignments.

Grades
The definitions for the letter grades are as follows:

A Outstanding performance; excellent command of course content.	A 100-96, A- 95-90
B Good, solid work; Good command of course content.	B+ 89-87, B 86-84, B- 83-80
C Meet minimum requirements; Satisfactory performance; Average command of course content.	C+ 79-77, C 76-74, C- 73-70
D Marginally; below average command of course content; Minimally acceptable performance.	D+ 69-67, D 66-64, D- 63-60
F Unsatisfactory performance; Inadequate knowledge of course content.	59 points or below

Course Schedule

Week	Day	Topic	Readings	Assignments
1	1/8	Introduction, Technology resources for teachers, and signing up to Course Compass	ISTE standards, and National Board for Professional Teaching Standards	
2	1/15	Issues surrounding the use of educational technology	Ch. 1, 2	
3	1/22	Issues surrounding using the Internet as an Educational Resources, and using Library resources	Ch. 3, 4	Online Discussion Due 1/23 and 1/25
4	1/29	Learning theories and technology curriculum integration	Ch. 6, 7	Online Discussion Due 1/30 and 2/1
5	2/5	**Revised: Class Canceled**		
6	2/12	**Revised:** Using PowerPoint to create a presentation of personal philosophy and student presentations		Personal Philosophy Paper
7	2/19	**Revised:** Using your accounts, using your server space, examining WebQuests, and designing a WebQuest	Ch 8, 10, The WebQuest Page	Interview Paper
8	2/26	Using Macromedia Dreamweaver Using Inspiration and Microsoft Publisher	Microsoft Office 2000 Resources for Educators, and Visual Inspiration	
9	3/5	Technology Integration Unit individual work time		
10	3/12	Revised: More individual work time Technology Integration for Technology Integration Unit Responsible	Technology Integration Lesson	
11	3/19	**Spring Break!!**		
12	3/26	Creating a Web Based Portfolio, and designing Web pages.	Ch 13, A Nation Online, PBS DigitalDivide	
13	4/2	Assistive Technologies- Speaker Craig Boogaard from The Computer Center for Citizens With Disabilities		
14	4/9	Work on Portfolio		
15	4/16	Portfolio Presentation		Portfolio
16	4/23	No class		

13 STANDARDIZED SYLLABUS COVER SHEET

Course Number:	**Course Name**:	**Semester/Year**:
TL 5410	Curriculum and Assessment In a Diverse Society	Fall 2002

Instructor/Professor's Name & Departmental Contact Information (address, phone, e-mail):

Brief Course Description (as described in the U of U catalog):

Alignment with NCATE Program Standards Licensure programs in which this course is included:

Relevant standard(s) met by course:

NCATE STANDARDS

Teaching Preparation:

PRAXIS STANDARDS

Candidate Assessment– Indicate how specific candidate knowledge, skills, dispositions, and P-12 student learning are assessed in the course.

Teaching and Learning 5410 & 6410, Section 3
Secondary School Curriculum and Assessment in a Diverse Society
Fall 2002

Course Instructor: Mary D. Burbank
Office: MBH 140; Office hours: Thursday 1:00-2:30.
Phone: 581-6074; Home - 581-9682 - E-Mail : mary.burbank@ed.utah.edu
Class Location: Teacher Education Sites in the Salt Lake and Granite school districts, Mondays, 134 OSH 7:30-10:30 a.m. See Schedule below.

This course meets PRAXIS Standards: A1, A3, A5, B2, B3, C3, D4

The University of Utah and the Department of Teaching and Learning seek to provide equal access to its programs, services, and activities for people with disabilities. Reasonable prior notice is needed to arrange accommodations.

Withdrawal policies:

Last day to drop (delete) classes with no tuition penalties Fri, Aug 30

Second session classes begin Tues, Oct 16

Last day to add classes Tues, Sept 3

Last day to withdraw from term length classes Fri, Oct 18

Last day to elect CR/NC option or to audit a class Tues, Sept 4
Tuition payment due Wed, Sept 11
Last day to drop (delete) second session classes with no tuition penalties Thurs, Oct 24
Last day to add second session classes Mon, Oct 28
Last day to reverse CR/NC option Mon, Dec 2

***Required Texts**: • Selected Readings in required course pack.*

Course Overview and Objectives:

The purpose of this course is to provide each student with the theoretical and practical foundations for understanding and using curriculum and assessment in secondary school teaching. In particular, we will explore these two educational topics and examine how they are influenced by our increasingly diverse society.

The course has been designed with the needs of the novice secondary school teacher in mind. Every effort will be made to accommodate the subject area specialties of students in the course will also require some initiative on the part of each one of you. While curricular concerns and assessment approaches cut across subject area boundaries, there remain many situations that require looking at the issues through the lens of one's particular subject area specialty. Fortunately, having students representing a variety of subject areas can assist us with recognizing the overarching nature of the concepts embedded in the course.

If this course was purely theoretical, it would not provide any of us with the skills we desire to be effective classroom teachers. However, if the course overemphasized methods of teaching, we would leave the course without obtaining the history and definitions that define and shape the teaching profession. To consider curriculum and assessment solely from one's personal experiences and with the narrow purpose of "making it through" student teaching reflects a perspective that is unambitious and ultimately unfair to one's future students.

Course Objectives include:

- describe key concepts and terms relative to curriculum and assessment.
- explain how a teacher might adjust a curriculum to make it more culturally resonant within a diverse classroom.

- identify and summarize curricular standards within a particular subject area.
- critique a text or curricular materials from your student teaching site for its key assumptions as well as its fit within subject area standards.
- compare and contrast a variety of purposes for and approaches to assessment.
- demonstrate assessments that are designed to appropriately accommodate diversity.
- design assessment tools that assist in judging student learning and evaluating the quality of instruction provided to students.

Semester Overview: As you begin your student teaching experience, you will be challenged to examine a number of issues. In addition to identifying your role as teacher, a series of themes will emerge, be revisited, and evaluated as you reflect upon your decision to teach. Through **reflection** and an analysis of current **research** you will be provided with opportunities which meet with the demands of contemporary classrooms. By establishing and maintaining professional **relationships**, a **repertoire** of strategies and means of analysis will develop and assist you in meeting the diverse and ever-changing nature of classrooms and schools.

Grading: All papers for T&L 5/6410-3 should be typed, double-spaced, with standard font and margins and will be read and evaluated based upon clarity, quality of thought, and depth of analysis. Please do not assume that the reader of your work will have an understanding of your thoughts and intentions. Therefore, provide clear, well-written descriptions and analyses of the material covered. In each of your assignments you will be asked to provide work that is reflective and thoughtful.

Late papers for T&L 5410-3 will be subject to a 10 percent loss of points per day. Please note that extensions are permissible under **emergency** situations.

Course Assignments Please note that detailed written overviews will be provided for each of the following assignments and will be shared and discussed in class.

- Complete **the** Diversity Assignment
- Complete **the** Assessment Plan
- Complete **the** Unit and Lesson Plans
- Complete **an Act**ion Research Proposal
- Complete **all** readings and be prepared to discuss content in class.

Grades for this course will be determined by the instructor. Successful completion of the following criteria apply to **ALL ASSIGNMENTS AND/OR PROJECTS**:

Participation - Active participation includes, but is not limited to, attending to seminar/presentation content, communicating, and offering suggestions, feedback and or analysis during class discussions.

100 pts.

Professionalism - A specific, though not inclusive, list of behaviors that address professionalism includes: completing assignments in a timely fashion, displaying evolving attitudes toward teaching and learning, developing assignments that are of high quality, demonstrating an openness to suggestions, seeking advice when needed, and sharing ideas with others.

100 pts

Point Distribution

Participation and Professionalism (Points earned daily)	= 200 points
Diversity Study (1-2 Pages)	= 100 points
Assessment Plan (1-2 Pages)	= 100 points
Unit Plan and Lesson Plans	= 100 points
ction Research Proposal (1-2 Pages)	= 100 points

Grade Distribution

Total = 600 points	600-564 = A	503-480 = B-	419-402 = D+
	563-540 = A-	479-462 = C+	401-384 = D
	539-522 = B +	461-444 = C	
	521-504 = B	**443-420 = C-**	

In Class Assignments will include but are not limited to:

Curriculum Critique -
In this assignment you will demonstrate you understanding of curriculum by applying that information to a dissection of a textbook or other curricular materials in your content area. Detailed expectations will be given including the criteria you are to apply to the text. In the meantime, you should begin looking for a teacher's guide edition for a secondary textbook within your subject area.

Assessment Instrument Critique -
You are to locate a test that is used to assess student learning within your subject area expertise. Specific guidelines will provided to you when the assignment is officially assigned. In the meantime, you should remain attentive to potential sources of subject area tests.

14 STANDARDIZED SYLLABUS COVER SHEET

Course Number:	**Course Name**:	**Semester/Year**:
TL 5411	Instruction and Management in a Diverse Society	Fall 2002

Instructor/Professor's Name & Departmental Contact Information (address, phone, e-mail):

Brief Course Description (as described in the U of U catalog):

Alignment with NCATE Program Standards Licensure programs in which this course is included:

Relevant standard(s) met by course:

NCATE STANDARDS

Teaching Preparation:

PRAXIS STANDARDS

Candidate Assessment– Indicate how specific candidate knowledge, skills, dispositions, and P-12 student learning are assessed in the course.

Teaching and Learning 5/6411 – 3

Fall 2002
Instruction and Management in a Diverse Society

The University of Utah and the Department of Teaching and Learning seek to provide equal access to its programs, services, and activities for people with disabilities. Reasonable prior notice is needed to arrange accommodations.

Praxis Criteria Addressed in 5/6410

Domain A - Organizing Content Knowledge for Student Learning
A2 - Articulating clear learning goals for the lesson that are appropriate for students
** Developing lesson plans that align with multiple learner needs*
** Examining the culture of classrooms and schools*
** Using knowledge of adolescent development to inform lesson development*
A4 - Creating or selecting methods, learning activities, and instructional materials or other resources that are appropriate for the students and that are aligned with the goals of the lesson.
** Aligning instruction to meet with learner needs (e.g., collaborative learning activities, inductive and deductive instruction, constructivist learning activities*
Domain B - Creating an Environment for Student Learning
B1 - Creating a climate that promotes fairness
** Developing a management philosophy and creating management and disclosure documents*
** Attending to questioning strategies, classroom expectations and rules*
** Making the relationships between instructional strategies and management explicit (e.g., routines, pacing, procedures).*
B4 - Establishing and maintaining consistent standards of classroom behavior
** Completing classroom management assignments that address preventative, supportive and corrective classroom interaction procedures and policies.*
Domain C - Teaching for Student Learning
C-3 - Encouraging students to extend their thinking
** Completing reflective writings associated with classroom management packet, school culture assignment and student diversity study.*
Domain D - Teacher Professionalism
D1 - Reflecting on the extent to which learning goals were met.
** Teaching micro lessons using video and audio tapes to evaluate lesson success.*

Withdrawal policies: Last day to drop (delete) classes with no tuition penalties Fri, Aug 30
Last day to add classes Tues, Sept 3
Last day to elect CR/NC option or to audit a class Tues, Sept 4
Tuition payment due Wed, Sept 11
Last day to withdraw from term length classes Fri, Oct 18
Second session classes begin Tues, Oct 16
Last day to drop (delete) second session classes with no tuition penalties Thurs, Oct 24
Last day to add second session classes Mon, Oct 28
Last day to reverse CR/NC option Mon, Dec 2

***Required Texts**:*

- *Charles, C.M. (1996). Building Classroom Discipline: From Models to Practice. White Plains, NY: Longman.*

- *Echevarria, J. & Graves, A. (1998). Sheltered content instruction: Teaching English language learners with diverse abilities. Boston: Allyn and Bacon.*
- *Kohn, A. (1996). Beyond discipline: From compliance to community. Alexandria Virginia: ASCD*
- *Teacher Candidate Handbook. - Available in 142, MBH.*
- *Selected Readings in required course pack.*

***Purpose**: The purpose of this course is to provide an introduction to issues in classroom instruction and their relationship to the multiple factors impacting effective teaching. In addition to general principles of instruction, an introduction to models of classroom management will critically review the multiple factors influencing classroom discipline. Specifically, we will examine the integral relationship between school culture (i.e., students, teachers, and families) curriculum, instruction, and cultural and linguistic diversity.*

***Semester Overview**: As you begin your student teaching experience, you will be challenged to examine a number of issues. In addition to identifying your role as teacher, a series of themes will emerge, be revisited, and be evaluated as you reflect upon your decision to teach. Through **reflection** and an analysis of current **research** you will be provided with opportunities which meet with the demands of contemporary classrooms. By establishing and maintaining professional **relationships**, a **repertoire** of strategies and means of analysis will develop and assist you in meeting the diverse and ever-changing nature of classrooms and schools.*

Course Assignments

- *Complete **the** Content Autobiography assignment.*
- *Complete **one** assignment as listed in the Culture packet provided.*
- *Complete **one** assignment as listed in the Management packet provided.*
- *Complete **class** management presentation.*
- *Complete **all** readings and be prepared to discuss content in class.*

***Presentations**: An oral group presentation will be given on one of the management models to be discussed this semester. Group assignments will be made in time to prepare for the presentations in October.*

Grading

All papers for T&L 5/6411-3 should be typed, double-spaced, with standard font and margins and will be read and evaluated based upon clarity, quality of thought, and depth of analysis. Please do not assume that the reader of your work will have an understanding of your thoughts and intentions. Therefore, provide clear, well-written descriptions and analyses of the material covered. In each of your assignments you will be asked to provide work that is reflective and thoughtful.

*Successful completion of the following criteria apply to **ALL ASSIGNMENTS AND/OR PROJECTS**:*

***Participation** - Active participation includes, but is not limited to, attending to seminar/presentation content, communicating, and offering suggestions, feedback and or analysis during class discussions. 100 pts.*

***Professionalism** - A specific, though not inclusive, list of behaviors that address professionalism includes: completing assignments in a timely fashion, displaying evolving attitudes toward teaching and learning, developing assignments that are of high quality, demonstrating an openness to suggestions, seeking advice when needed, and sharing ideas with others.*
100 pts.

Point Distribution

Participation and Professionalism (Points earned daily)	*= 200 points*
Content History	*= 100 points*
Culture Packet	*= 100 points*
Management Packet	*= 100 points*
Management Presentation	*= 100 points*

Total = 600 points

600-564 = A	479-462 = C+
563-540 = A-	461-444 = C
539-522 = B +	**443-420 = C-**
521-504 = B	419- 402 = D+
503-480 = B-	401-384 = D

15 STANDARDIZED SYLLABUS COVER SHEET

Course Number:	**Course Name**:	**Semester/Year**:
TL 5490	Field/Practicum Experience	

Instructor/Professor's Name & Departmental Contact Information (address, phone, e-mail):

Brief Course Description (as described in the U of U catalog):

Alignment with NCATE Program Standards Licensure programs in which this course is included:

Relevant standard(s) met by course:

NCATE STANDARDS

Teaching Preparation:

PRAXIS STANDARDS

Candidate Assessment– Indicate how specific candidate knowledge, skills, dispositions, and P-12 student learning are assessed in the course.

Teaching and Learning 5/6490-3
Field/Practicum Experience
Fall 2002

This course meets Praxis Standards:

C1 - Making learning goals and instructional procedures clear to students.
C2 - Making content comprehensible to students
C4 - Monitoring students' understanding of content through a variety of means, providing feedback to students to assist learning, and adjusting learning activities as the situation demands
D2 - Demonstrating a sense of efficacy

Meeting Time: Wednesday - Friday, 7:30-10:30 a.m. public school placement sites.

Purpose

The purpose of this course is to examine issues related to the beginning of an effective school year. The field practicum will assist you in becoming a reflective practitioner through involvement in the crucial beginning months of the school year as teachers establish their routines and management strategies. By participating in the field practicum, you will have the opportunity to experience the manner in which teachers set the tone for the entire school year. An important component of this course is for Teacher Candidates to understand the role of teachers and teachers' work through direct observation and participation.

Attendance

Teacher Candidates are expected to follow the allotted course hours for T&L 5/6490-3. Note that time commitments in classrooms will coincide with site visits held in conjunction with T&L 5/6411-3. If you must miss a field day due to illness, contact your STE, **AND** your university supervisor the morning you will miss class. If you are unable to contact your STE and University supervisor directly, leave messages as necessary. Please note that excessive absences (i.e., 2+) or missed time may result in an extended field placement schedule and/or failure to be recommended for certification.

ASSIGNMENTS

Teacher Portfolio

• A portfolio is a purposeful collection of work that exhibits one's professional efforts, progress, and achievements in one or more areas. A portfolio demonstrates mastery of skills of inquiry and provide an opportunity to express understandings of specific topics.

During autumn semester we will focus our studies on the interplay between culture, management, diversity, instruction, and curricula. From a list of options you will choose assignments related to each of the semester themes. At this point in time your field portfolio will include information gained during class visits to your student teaching site. The materials you gather from the field will be combined with assignments from 5/6410-3 and 5/6411-3 in preparation for job interviews and other professional endeavors.

At the end of the semester you will be asked to gather your work from the entire quarter to be presented in your final portfolio. In addition, to your "best work" you are encouraged to consider any other professional works which reflect your growth as a future teacher. With your final portfolio please include a guide to the reader.

The following assignments will certainly be influenced by your Site Teacher Educator, however over the course of the next year you will be asked to prepare your own versions of these items both for your full time student teaching and for the purpose of interviews. Portfolios are due during your interviews scheduled for 12/9 or 12/10/02.

10 pts. 1. Classroom Disclosure Statement - Developed in 5/6411-3.
10 pts. 2. Classroom Management Plan - Developed in 5/6411-3.
10 pts. 3. Long Range Unit and Lesson Plans - Developed in 5/6410-3.
10 pts. 4. Student Assessment Plan - Developed in /6410-3.
10 pts. 5. Philosophy Statement/Content History Developed in 5/6411-3.
10 pts. 6. Diversity Plan - Developed in 5/6410-3
40 pts. 7. Portfolio presentation

Miscellaneous Materials

7. Video **OR** audio tape
8. Meetings (notes from meetings attended)
9. Other (label any sections you choose to add)
10 Observation Notes from STE and supervisor

• **Teaching**: Working with your Site Teacher Educator to prepare for spring semester.

Grading

A **Credit/No Credit** grade for this course will be determined jointly by your STE and your university supervisor. STE evaluations will be based upon attendance, preparation of appropriate teaching materials and teaching methods (e.g., cooperative learning, student-centered, developing evaluation and questioning techniques), planning, and overall growth. STEs will be asked to submit an evaluation of these areas at the end of The Field Practicum (i.e., Evaluation Checklists due to Cohort Leader by December 6, 2002).

Assignments must be submitted and completed at a passing level. Grades will be based upon the successful completion of the following:

100 Assignments
- Portfolio - Assignments 1-7.
- Self-Evaluation - See form provided.
- Site Teacher Evaluation - Form provided

100 Participation
- Attendance at your site - Wednesday - Friday
- Active participation in site teaching activities. Participation includes, but is not limited to, collaborating with your Site Teacher Educators, communicating, offering suggestions, and contributing feedback and examining ways of developing as an educator.

100 Professionalism • A specific, though not inclusive, list of behaviors that address professionalism include: completing assignments in a timely fashion, displaying evolving attitudes towards teaching and learning, developing assignments that are of high quality, being open to suggestions, seeking advice when needed, sharing ideas with others, recognizing diversity in others' perspectives.

Total = **300 points**

300-282 = A
281-270 = A- = CREDIT
269-261 = B+

**Note that as a Teacher Candidate in the Department of Teaching and Learning, you will be required to adhere to the Utah Professional Practices Advisory Committee's (UPPAC) standards as well as university, district, and departmental policies regarding professional and ethical behavior. A detailed discussion of criteria in these areas is available in the Teacher Candidate Handbook (reviewed in the fall), in the university's quarterly class schedule, and will be discussed throughout your student teaching experience.

16 STANDARDIZED SYLLABUS COVER SHEET

Course Number:	**Course Name**:	**Semester/Year**:
TL 5491	Action Research	Spring 2003

Instructor/Professor's Name & Departmental Contact Information (address, phone, e-mail):

Brief Course Description (as described in the U of U catalog):

Alignment with NCATE Program Standards Licensure programs in which this course is included:

Relevant standard(s) met by course:

NCATE STANDARDS

Teaching Preparation:

PRAXIS STANDARDS

Candidate Assessment– Indicate how specific candidate knowledge, skills, dispositions, and P-12 student learning are assessed in the course.

Teaching and Learning 5/6491-3

Student Teaching Seminar/ Action Research - Spring Semester 2003

Seminar Meeting Times: Wednesdays, **3:00-5:30**, Highland High School, Room E214.
Note that the majority of cohort meeting times will change 8:30-1130 p.m. beginning March 28, 2003.
* See enclosed schedule for details.
Please note that you will be compensated two weeks at the end of the semester in order to account for the 1/6/03 start up of student teaching and the requirement of teaching through the University's spring break.

A required text will be provided as a part of a weekly professional development book club activity.

·This course meets NCATE standards: A3, A4, A5, D1, D2, D3, D4,
·The University of Utah and the Department of Teaching and Learning seek to provide equal access to its programs, services, and activities for people with disabilities. Reasonable prior notice is needed to arrange accommodations.

Class Structure

•Issues in Your Teaching Lives
•Issues in the Field
•Meeting on common ground and applying what you've learned to your teaching.
•Action Research

Issues in the Field

Purpose: The purpose of this course is to reflect on the practice of teaching, identify problems and solutions, and discuss issues related to teaching including parent/guardian/teacher relationships, inclusion, teaching accommodations, assessment, and student perceptions.

Action Research

An *Action Research* component will be the area from which weekly assignments are generated. "*Action Research* is an integrative methodology in that it brings together inquiry about self and context and provides the opportunity to pull together information from a number of sources" (Bullough & Gitlin, 1995).

Course Topics and Calender of Events

Ongoing assignments -

·In addition to formal assignments, your lesson plans should be available for review by your supervisor during classroom visits. See time table and Syllabus for T&L 5/6495-3 for review dates.
·A video tape and analysis are due **ON OR BEFORE March 14, 2003**. Note that video cameras are available at each of your sites. Please contact the audio visual specialist at your school. This is typically the librarian.

Grading

All papers for T&L 5/6491-3 should be typed, double-spaced, and will be read and evaluated based upon clarity, quality of thought, and depth of analysis. Please do not assume that the reader of your work will have an understanding of your thoughts and intentions. Therefore, provide clear, well written descriptions and analyses of the material covered. In each of your assignments you will be asked to provide work which is reflective and thoughtful.

Late papers for T&L 5/6491-3 will be accepted up to THREE days with a 10% deduction per day. Please note that because assignments will build upon each other, it is important that work be turned in on time so that it may returned to you without delay.

When completing written assignments, remember that your audience will be colleagues and the course instructor. Written work should demonstrate your interests and experiences from your teaching. Note that your writing should be reflective and professional. Reflective and professional writing should include an objective and a constructive discussion of information. Avoid simply listing events and experiences. That is, attend to the degree to which you are pushing your thinking. By moving beyond simple descriptions of your experiences your interpretations and attempts to understand issues will likely reach beyond surface discussions. Reflection is more than "thinking hard" (Bullough and Gitlin, 1995).

Assignments:

1. ·Peer Interview (1)- **30 pts**.
2. · 2nd Peer Interview **OR** One observation and interview with **30 pts.**
   as administrator, special educator, or counselor.
3. ·Problem Identification and Rationale **30 pts.**
4. ·Plan of Action **30 pts**.
5. ·Data Collection Summaries - ** See due date schedule **60 pts.**
6. ·Video Tape and reaction **20 pts**.
7. ·Action Research Final Paper **65 pts.**
8. ·Class presentation of research project **30 pts**.
9. ·Portfolio - Personal Teaching Analysis and Self-Evaluation **55 pts.**
   (Your analysis should include a discussion of student evaluations of your teaching and an analysis of you video tape).

Grades for this course will be determined by the instructor. Successful completion of the following criteria apply to **ALL ASSIGNMENTS AND/OR PROJECTS**:

Participation - Active participation includes, but is not limited to: attending to seminar/presentation content, communicating, and offering suggestions, feedback and or analysis during discussions. **75 pts.**

Professionalism - A specific, though not inclusive, list of behaviors that address professionalism includes: completing assignments in a professional timely fashion, displaying evolving attitudes toward teaching and learning, developing assignments that are of high quality, demonstrating an openness to suggestions, seeking advice when needed, and sharing ideas with others. **75 pts.**

Total = 500 points	500-475 = A	419-400 = B-	349-335 = D+
	474-450 = A-	399-385 = C+	334-320 = D
	449-435 = B +	384-370 = C	
	434-420 = B	**369-350 = C-**	

** A grade of a C- or lower in EDST 5/6491-3 will require that you retake the course in order to be recommended for certification

17 STANDARDIZED SYLLABUS COVER SHEET

Course Number: **Course Name**: **Semester/Year**:

TL 5495 Student Teaching

Instructor/Professor's Name & Departmental Contact Information (address, phone, e-mail):

Brief Course Description (as described in the U of U catalog):

Alignment with NCATE Program Standards Licensure programs in which this course is included:

Relevant standard(s) met by course:

NCATE STANDARDS

Teaching Preparation:

PRAXIS STANDARDS

Candidate Assessment– Indicate how specific candidate knowledge, skills, dispositions, and P-12 student learning are assessed in the course.

Teaching and Learning 5/6495-3

Student Teaching
Spring Semester, 2003

This course meets NCATE Standards: C1, C2, C4, D2
Meeting Time: Mondays - Fridays, school contract hours (i.e., twenty minutes before and twenty minutes after teacher contract hours), January 6, 2003 - March 28, 2003 in selected urban student teaching sites ***OR*** until all grades and teaching responsibilities are completed at individual sites.

Purpose The purpose of this course is to examine issues related to classroom teaching in public schools and to become reflective practitioners through involvement in the daily practices of classrooms and schools. By participating in Student Teaching, you will have the opportunity to experience the manner in which teachers plan, evaluate, and reflect on teaching. An important component of this course is for Teacher Candidates to come to an understanding of the role of teachers and teachers' work through direct observation and participation.

Attendance Teacher Candidates are expected to follow the regular contract hours of teachers at designated sites. Teacher Candidates are required to attend **all** scheduled parent/guardian, district, and faculty meetings. Teacher Candidates may, with the consent of both their STE and university supervisor, become involved in before and after-school clubs and activities that will be of value to their own personal growth as a Teacher Candidate. **Note, however, that these activities may not interfere with teaching and cohort commitments. Payment for activity involvement during teacher contract hours is not permissible.**

If you must miss a teaching day due to illness, contact your STE, **AND** your university supervisor the morning you will miss class. If you are unable to contact your STE and university supervisor directly, leave messages as necessary. For those of you working with Elizabeth Beall and Talitha Hudgins, please contact Mary Burbank if you are unable to reach your direct supervisor. **Please note that excessive absences (i.e., 3 + days) or missed time will result in an extended student teaching schedule and/or failure to be recommended for licensure.**

Field Debriefing Meeting Dates and Location In addition to keeping contract hours, a weekly meeting will be held on Wednesdays from 3:00-5:30 at Highland High in room E214.

Please note that your attendance at all meetings is required, please be prompt. **Other than the weekly debriefing period, Teacher Candidates are expected to be on site for contract hours, Monday through Friday.**

Grading

A **Credit/No Credit** grade for this course will be determined jointly by your STE and your university supervisor. STE evaluations will be based upon attendance, preparation of appropriate teaching materials and teaching methods (e.g., cooperative learning, student-centered learning experiences), multiple evaluation and questioning techniques, co-planning, demonstrating commitment to professionalism in course and field work, and overall growth. See TC handbook and seminar discussions for specific criteria.

In order to pass the field component of student teaching, Teacher Candidates must receive a 3 or higher on all evaluation categories on the final evaluation. See Evaluation forms reviewed in class on 1/15/03 and at 3-way conferences

STE Final Evaluation Reports due to Cohort Leader by April 4, 2003.

Professionalism
**Note that as a Teacher Candidate in the Department of Teaching and Learning, you will be required to adhere to the Utah Professional Practices Advisory Committee's (UPPAC) standards as well as university, district, and departmental policies regarding professional and ethical behavior. A detailed discussion of

criteria in these areas is available in the Teacher Candidate Handbook (reviewed in the fall and spring), in the university's class schedule, and will be discussed throughout your student teaching experience.

APPENDIX I: Additional Mathematics Teaching Programs

Mathematics Teaching Minor Program:

Students who are completing a teaching major in another subject area can obtain a mathematics teaching minor by completing the courses listed below with a grade of C or higher.

Math 1210, Calculus I (4 credits)
Math 1220, Calculus II (4 credits)
Math 2210, Calculus III (3 credits)
Math 2270, Linear Algebra (3 credits)
Math 3070, Applied Statistics I (4 credit course in calculus based probability and statistics)
Math 3100, Foundations of Geometry (3 credits)
Math 3105, Geometry Practicum (1 credit)
Math 4030, Foundations of Algebra (1 credits)
Math 4035, Algebra Practicum (1 credit)
Math 4090, Teaching Secondary School Mathematics (3 credits)

Level Two Endorsement in Mathematics:

Elementary teaching majors who complete one of the courses listed below in each the four areas are recommended for an elementary license with a Level Two endorsement in mathematics.

Probability and Statistics: One of the following 3 credit courses
- Math 1040, Introduction to Statistics
- Math 1070, Elementary Statistics

Geometry: One of the following 4 credit options
- Math 3100, Foundations of Geometry and Math 3105, Geometry Practicum
- Math 4040, Perspectives on Geometry for Teachers

Calculus: One of the following 4 credit courses
- Math 1210, Calculus I
- Math 4050, Foundations of Calculus for Teachers

Mathematics Methods (3 credits)
- Math 4090, Teaching Secondary School Mathematics

APPENDIX II: Post Student-Teaching Survey

To those finishing your student teaching: Your name_____

In my never-ending quest to make the math methods course a truly useful course, I would ask you to take a few minutes and answer these questions. Please feel free to elaborate.

What did we do in the course that you found particularly useful in your teaching?

What did we do that you did not find very useful? (Be honest, I can take it.)

Is there something you feel we neglected to do which would have helped you?

If you took either practicum course from me (geometry or algebra) did that help?

In what ways did the practicum help you connect the math you studied in your courses to the mathematics content of the secondary classroom?

In what ways did you feel or not feel mathematically prepared for the secondary classroom?

How was your student teaching experience?

What are your plans for next year? Where do you hope to be?

APPENDIX III: Mathematics Department Exit Interview

Interviewer: _____ Date: _____

Exit Interview
University of Utah Mathematics Department

Name: _____
E-mail Address (optional) _____
Web Page Address (optional) _____
phone number (optional) _____

May we make (or maintain) a link for you on our alumni pages located at http://www.math.utah.edu/people/alumni.html? Circle preference.

No	Yes, use my e-mail address only.
Yes, use my web page URL only.	Yes, use my e-mail address and web pages addresses

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Overall, how satisified are you with the classes you took in the Math Department? Please rate course content as well as quality of teaching.

	Poor				Excellent
course content	○	○	○	○	○
teaching quality	○	○	○	○	○

Overall, how satisfied are with the support you received in the Math Department, outside of the classroom? Please take a few minutes to rate our tutoring center, computer lab, advising, interactions with faculty and staff, and the general sense of community.

	Poor				Excellent
tutoring center	○	○	○	○	○
computer lab	○	○	○	○	○
advising	○	○	○	○	○
faculty/staff interactions	○	○	○	○	○
sense of community	○	○	○	○	○

Do you wish to elaborate on these ratings?
Which math courses did you take here, and when did you take them?

What specific comments would you like to make about the strengths and weaknesses of any of these courses, or about your experiences in the Mathematics Department? What changes for improvement would you suggest?

_____

We are interested in what you can tell us about when and why you decided to become a math major: What attracted you to Mathematics? Which Math courses had you already taken, and were they influential in your decision to major in Mathematics? Did you have future career goals at the time? If so, what were these goals and were they related to your choice of major? Did you concentrate (major, minor or just focus) in other areas besides mathematics, and if so what were they?

What are your future plans? Has your mathematics education been effective in preparing you for a career? (Describe ways in which it has been especially effective or ineffective, ways in which this education might be improved.)

Looking back on your undergraduate years, which of your experiences related to being a Math major do you now think were the most valuable?

Which experiences were the least valuable?

We like undergraduate math majors to have the opportunities to be actively involved with mathematics, beyond their regular coursework and homework.. For example, students may currently take reading courses in which they study an area of their own choosing, they may complete individual or group projects in some of their classes, they may participate in internships, teaching or tutoring, or write a senior thesis.

Did you have an additional involvement with mathematics, beyond regular coursework and homework? If so please describe it and its value to you.

How can we make our undergraduate program more effective, from your point of view?

For example, we are trying to find more avenues for "active" involvement, and we are exploring ways for undergraduates, graduate students and faculty to work together collaboratively, as is more common in the lab sciences. We are contemplating an expansion of our summer program, both in terms of course offerings and collaborative projects.

Please comment on the summer program ideas, on the value of "active" and//or "collaborative" mathematics from your point of view, or on any other curricular and extracurricular issues which you feel are important for us to consider. With the insight from your own experiences you can help current and future undergraduates who major in Mathematics at the University of Utah..

Do you have any other comments?