Syllabus for
MAT 222--Mathematics Concepts II
3 Credit Hours
Fall 2008

I. COURSE DESCRIPTION

A study of the underlying theory of elementary mathematical concepts including probability, permutations, combinations, geometry, metrics, congruence, similarity, cartesian coordinates, and transformations using a problem-solving approach. (Does not count toward a major or minor in mathematics.)
Prerequisite: MAT 221.

II. COURSE GOALS

The purpose of this course is to provide future elementary school teachers with the mathematical background necessary to teach the mathematical content in the first through eighth grades. Students will gain an appreciation for the beauty and usefulness of mathematics; calculate and determine probability, permutations, combinations; describe basic geometric shapes, and calculate the length and area of two-dimensional figures; derive formulas for and calculate the surface area and volume of objects in three-dimensional space; utilize the Metric System and convert from English units to Metric units and vice-versa; define congruence and similarity of figures and determine whether two figures or similar or congruent; describe the Cartesian coordinate system; and utilize a variety of transformations of the plane to identify similarity and symmetry.

III. STUDENT LEARNING OUTCOMES FOR THIS COURSE

A. Unit Objectives

1. Unit 1: Probability

As a result of successfully completing this unit, the student will able to do the following.

a. Define the following terms.

certain event	impossible event
combination	independent events
complement	mutually exclusive
conditional probability	odds
event	outcome
expected value	permutation
experiment	replacement
factorial	sample space
fair game	simulation

b. Explain what is meant by the probability of an event.
c. Distinguish between and calculate experimental and theoretical probability.
d. Compute probabilities for events with equally likely outcomes.
e. Explain and apply the properties of probability.
f. Construct tree diagrams and apply the multiplicative rule to determine the probabilities of the outcomes in a sample space.
g. Model games and analyze them.

h. Use area models to calculate probabilities.
i. Explain and use simulations to estimate probabilities in complex experiments.
j. Explain and calculate odds in favor of and odds against an event.
k. Explain and compute conditional probabilities.
l. Explain and compute expected values for experiments whose outcomes are real numbers.
m. Explain and apply the fundamental counting property to determine the number of outcomes in a sample space and in events.
n. Calculate factorials.
o. Compute the number of permutations or combinations stated in symbolic notation.
p. Calculate the number of permutations with or without replacement.
q. Use combinations and permutations to calculate probabilities.
r. Use correct notation.

2. Unit 2: Basic Geometry

As a result of successfully completing this unit, the student will be able to do the following.

a. Define, describe, classify, identify, and/or illustrate the following terms.

acute triangles	planes
acute triangles	points
alternate exterior angles	polygon
alternate interior angles	polygonal region
angles	polyhedron
closed curve	prisms
collinear	pyramids
complements	quadrilaterals
concave	rays
concurrent	rectangles
cones	regular polygons
convex	regular polyhedra
coplanar	rhombuses
corresponding angles	right angles
cylinders	right triangles
diagonal	scalene triangles
dihedral angles	segments
equilateral triangles	simple curve
isosceles triangles	skew
kites	space
lines	spheres
obtuse angles	squares
obtuse triangles	straight angles
parallel	supplements
parallelograms	trapezoids
perpendicular	vertical angles

b. State properties common to various classes of polynomials and explain the relationships among these classes.
c. Use paper folding, dot paper, tracing paper, and other concrete techniques to demonstrate relationships in geometric figures including symmetry, perpendicularly, and parallelism.
d. Explain angle measurement and its common units.
e. Measure angles using a protractor.
f. Explain and illustrate why the sum of the measures of the interior angles of a triangle is 180^{o}.
g. Calculate the measure of angles based on given information.
h. Describe how to determine the measure of a dihedral angle.
i. Name three-dimensional figures.
j. Use proper notation.

3. Unit 3: Constructions, Congruence, Similarity, and Coordinate System
As a result of successfully completing this unit, the student will be able to do the following.
a. Define, describe, identify, and/or illustrate the following terms.

abscissa	linear
altitude	major arc
angle bisector	midsegments
arc	minor arc
axis	ordinate
best-fitting line	origin
center of an arc	perpendicular bisector
chord	rep-tile
circumcenter	scale factor
circumscribed	semicircle
congruent	similar
elimination method	slope
incenter	substitution method
included	tangent
inscribed	triangle inequality

b. State and apply the SAS, ASA, SSS, and AAS congruence properties.
c. State and apply properties of quadrilaterals.
d. State and apply the SAS, AA, and SSS similarity properties.
e. Perform and justify the compass and straightedge constructions.
f. Solve problems using congruence and similarity.
g. Locate points in the plane using their coordinates.
h. Graph lines.
i. Calculate slope.
j. Find the slope-intercept form of the equation of the line.
k. Solve a system of linear equations and interpret geometrically.
l. Fit a line to data.
m. Use proper notation.

4. Unit 4: Measurement
As a result of successfully completing this unit, the student will be able to do the following.

a. Define, describe, identify, and/or illustrate the following terms.

central angle	circumference
legs	diameter
greatest possible error	hypotenuse
perimeter	radius
sector	

b. Describe the English and metric systems.
c. State the approximate sizes of the most common units in the English and metric systems.
d. Perform conversions using dimensional analysis.
e. Calculate perimeter and circumference.
f. Derive the formulas for areas.
g. Calculate area.
h. Prove the Pythagorean Theorem.
i. Apply the Pythagorean Theorem and its converse to determine lengths.
j. Determine the side lengths and angle measures of the two special right triangles.
k. Calculate distance.
l. State and apply Triangle Inequality.
m. Derive the formulas for surface area.
n. Calculate surface areas.
o. Derive the formulas for volume.
p. Explain and apply Cavalieri's principle
q. Calculate volumes.
r. Explain the relationships among metric units of volume, capacity, and mass and use them to solve problems
s. Convert between degrees Celsius and degrees Fahrenheit.

5. Unit 5: Transformations and Tessellations

As a result of successfully completing this unit, the student will be able to do the following.

a. Define, describe, identify, and/or illustrate the following terms.

angle of incident	reflection
angle of reflection	regular tessellation
axis of rotation	rigid motion
flip	rotation
glide reflection	rotational symmetry
half-turn	semi-regular tessellation
identity transformation	similar
isometries	size transformation
line of symmetry	slide
line symmetry	slide arrow
mirror image	slide line
orientation	tessellation
perspective drawing	transformation
plane of symmetry	translation
point symmetry	turn
preimage	turn angle
reflecting line	vector

b. Perform transformations and size transformations.
c. Construct transformations.
d. Represent transformations on the coordinate system.
e. State and apply the slopes of parallel lines property and perpendicular lines property.
f. Use isometries to determine if two figures are congruent.
g. Identify regular and semi-regular tessellation.
h. Create tessellations of the plane.

B. Objectives for Students in Teacher Preparation Programs

The course goals for the Teacher Preparation Program meet the competency-based requirements established by the Oklahoma Commission on Teacher Preparation. This course meets the following competencies: Elementary Mathematics Competencies (EMC) 4-7.

This course is designed to help the student meet subject competencies:

EMC 4: Has a broad and deep knowledge of the concepts, principles, techniques and reasoning methods of mathematics that is used to set curricular goals and shape teaching.

EMC 5: Understands significant connections among mathematical ideas and the applications of these ideas to problem-solving in mathematics, in other disciplines and in the world outside of school.

EMC 6: Has experiences with practical applications of mathematical ideas….

EMC 7: Is proficient in, at least, the mathematics content needed to teach the mathematics skills described in Oklahoma's core curriculum, from multiple perspectives. This includes, but is not limited to, a concrete and abstract understanding of geometry, measurement, … and probability … necessary to effectively teach the mathematics content skills addressed in the first through eighth grade as well as the mathematics process skills of problem-solving, reasoning, communication, and connections.

IV. TEXTBOOKS AND OTHER LEARNING RESOURCES

Required Materials

A. Textbooks

Billstein, R., Libeskind, S., & Lott, J. (2007). *A problem solving approach to mathematics for elementary school teachers*. 9th ed. Boston, MA: Pearson Education, Inc.

B. Other

1. *MyMathLab: Student access kit*. (n.d.). Boston: Addison Wesley.
2. Scientific calculator
3. Graph paper
4. Ruler with English and Metric markings
5. Protractor
6. Compass

V. POLICIES AND PROCEDURES

A. University Policies and Procedures

1. Attendance at each class or laboratory is mandatory at Oral Roberts University. Excessive absences can reduce a student's grade or deny credit for the course.
2. Students taking a late exam because of an unauthorized absence are charged a late exam fee.
3. Students and faculty at Oral Roberts University must adhere to all laws addressing the ethical use of others' materials, whether it is in the form of print, video, multimedia, or computer software. By submitting an assignment in any form, the student gives permission for the assignment to be checked for plagiarism, either by submitting the work for electronic verification or by other means.
4. Final exams cannot be given before their scheduled times. Students need to check the final exam schedule before planning return flights or other events at the end of the semester.
5. Students are to be in compliance with University, school, and departmental policies regarding ePortfolio requirements. Students should consult the ePortfolio handbooks for requirements regarding general education and the students' majors.
    a. The penalty for not submitting electronically or for incorrectly submitting an ePortfolio artifact is a zero for that assignment.
    b. By submitting an assignment, the student gives permission for the assignment to be assessed electronically.

B. Department Policies and Procedures

1. Each Student who uses the computer is given access to the appropriate computer resources. These limited resources and privileges are given to allow students to perform course assignments. Abuse of these privileges will result in their curtailment. Students should note that the contents of computer directories are subject to review by instructors and the computer administrative staff.
2. A fee of $15.00 will be assessed for all late exams. This policy applies to all exams taken without notifying the professor prior to the regularly scheduled exam time, and to all exams taken late without an administrative excuse.
3. Any student whose unexcused absences total 33% or more of the total number of class sessions will receive an F for the course grade.

C. Course Policies and Procedures

1. Evaluation Procedures
    a. Grading Scale

MyMathLab Homework Average	=	20%
Discussion Average	=	20%
4 Examinations (10% each)	=	40%
Final Exam	=	20%
Total	=	100%

This course does not require an ePortfolio artifact.

This course participates in the CSC/Math Department Participation Development Points Program.

b. Point Distribution:
90% - 100%..... A
80% - 89%..... B
70% - 79%..... C
60% - 69%..... D
Below 60%..... F

2. ePortfolio Requirements
This course does not require an ePortfolio artifact.

3. Other Policies and/or Procedures

a. This is a hybrid course. Much of the homework and many learning resources are found in the online portion of the course called *MyMathLab*. The web address is www.coursecompass.com.

b. Students are expected to prepare for each lesson before coming to class by using any or all of the resources available to them in the textbook and in *MyMathLab*.

c. Homework and Assignment due dates will be posted in *MyMathLab*. Be sure to check the Course Calendar frequently. The instructor does not have to accept late work.

VI. COURSE CALENDAR

Lesson	Text	Topic	Assignment
1		Introduction	Log onto *MyMathLab*
2	7-1	Probability Basics	Homework 1
3	7-2	Multistage Experiments	Homework 2
4		**Chapter 7**	**Discussion 1**
5	7-3	Simulations	Homework 3
6	7-4	Odds, Conditional Probability, and Expected Value	Homework 4
7	7-5	Permutations and Combinations	Homework 5
8		**Chapter 7**	**Discussion 2**
9		**Review**	
10		**Exam 1: Chapter 7**	
11	9-1	Basic Geometry Notation	Homework 6
12	9-2	Polygons	Homework 7
13	9-3	Angles	Homework 8
14	9-4	Three Dimensional Geometry	Homework 9
15		**Chapter 9**	**Discussion 3**
16		**Review**	
17		**Exam 2: Chapter 9**	
18	10-1	Congruence and Constructions	Homework 10

Lesson	Text	Topic	Assignment
19	10-2	Construction Properties	Homework 11
20	10-3	More Constructions	Homework 12
21		**Chapter 10**	**Discussion 4**
22	10-4	Similarity	Homework 13
23	10-6	Cartesian Coordinate System	Homework 14
24		**Chapter 10**	**Discussion 5**
25		**Review**	
26		**Exam 3: Chapter 10**	
27	11-1	Linear Measure	Homework 15
28	11-2	Area	Homework 16
30	11-3	Pythagorean Theorem and Distance Formula	Homework 17
31		**Chapter 11**	**Discussion 6**
32	11-4	Surface Area	Homework 18
33	11-5	Volume, Mass, and Temperature	Homework 19
34		**Chapter 11**	**Discussion 7**
35		**Review**	
36		**Exam 4: Chapter 11**	
37	12-1	Translations and Rotations	Homework 20
38	12-2	Reflections and Glide Reflections	Homework 21
38	12-5	Tessellations	Homework 22
40		**Chapter 10**	**Discussion 8**
41		**Review for Final Exam**	
		Comprehensive Final Exam	

Course Inventory for ORU's Student Learning Outcomes

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This course contributes to the ORU student learning outcomes as indicated below:
Significant Contribution – Addresses the outcome directly and includes targeted assessment.
Moderate Contribution – Addresses the outcome directly or indirectly and includes some assessment.
Minimal Contribution – Addresses the outcome indirectly and includes little or no assessment.
No Contribution – Does not address the outcome.

The Student Learning Glossary at http://ir.oru.edu/doc/glossary.pdf defines each outcome and each of the proficiencies/capacities.

OUTCOMES & Proficiencies/Capacities	Significant Contribution	Moderate Contribution	Minimal Contribution	No Contribution
1	**Outcome #1 – Spiritually Alive** Proficiencies/Capacities				
1A	Biblical knowledge				X
1B	Sensitivity to the Holy Spirit			X	
1C	Evangelistic capability				X
1D	Ethical behavior				X
2	**Outcome #2 – Intellectually Alert** Proficiencies/Capacities				
2A	Critical thinking	X			
2B	Information literacy				X
2C	Global & historical perspectives			X	
2D	Aesthetic appreciation			X	
2E	Intellectual creativity			X	
3	**Outcome #3 – Physically Disciplined** Proficiencies/Capacities				
3A	Healthy lifestyle				X
3B	Physically disciplined lifestyle				X
4	**Outcome #4 – Socially Adept** Proficiencies/Capacities				
4A	Communication skills	X			
4B	Interpersonal skills				X
4C	Appreciation of cultural & linguistic differences				X
4D	Responsible citizenship			X	
4E	Leadership capacity			X	