COURSE NAME: Foundations of Elementary Mathematics

COURSE NUMBER: MTH 390

COURSE CREDITS: 4 credits

COURSE PREREQUISITES: MTH 211 [C-], MTH 212 [C-]

CATALOG DESCRIPTION: Math 390 is the third of a three-term sequence of classes designed to help prepare prospective elementary and middle school teachers. Topics covered include: Informal geometry, measurement, congruence, similarity, coordinate and transformational geometry.

COURSE CONTENT: This course presents mathematical content needed for teaching at the elementary and middle school levels. It focuses intensively on problem solving throughout while covering the following topics:

- The Van Hiele Theory of Geometric Reasoning
- Recognizing and analyzing geometric shapes
- Introduction to a formal approach to geometry
- Describing three dimensional shapes
- Measurement in two and three dimensions
- Triangle congruence and similarity properties
- Euclidean constructions
- Transformations

COURSE-SPECIFIC MEASURABLE STUDENT LEARNING OUTCOMES:
A successful student in Math 390 will be able to:

1. Describe Levels 0-4 of the van Hiele Theory of Geometric Reasoning.
2. Apply the definitions of and/or give examples of plane, point, line, line segment, ray, parallel lines, perpendicular lines, transversal, types and features of angles, and apply and prove a variety of angle properties.
3. Classify regular and non-regular polygons, and prove properties related to their angle measures and diagonals.
4. Apply the definitions of curve, simple curve, closed curve, polygon (n-gon), regular polygon, convex polygon, concave polygon, polygonal region.
5. Determine whether a tessellation is regular, semi-regular, or neither one and explain which regular polygons will tessellate the plane by themselves and which may be combined to form a tessellation and WHY.
6. Classify 3 dimensional shapes as polyhedron, convex or concave polyhedron, prisms (right or oblique), pyramids (right or oblique), regular polyhedron (i.e. Platonic solids), cones (right or oblique), and cylinders (right or oblique).
7. Describe and analyze the bases of prisms, pyramids, cylinders, and cones; the lateral faces of a pyramids and prisms; and the height and slant heights of these objects. Use this information to develop surface area and volume formulas.
8. Use dimensional analysis to convert between units of measurement.
9. Demonstrate how to find area, perimeter and circumference without reference to formulas. Use these techniques to develop the area and perimeter formulas for a rectangle, triangle, parallelogram, and trapezoid.
10. Sketch, label, and determine the measures of the bases and corresponding altitudes of a triangle, rectangle, trapezoid, and parallelogram.

11. Describe the shape of the standard units used for length, area, surface area, and volume.

12. State and apply the Pythagorean Theorem and the Triangle Inequality.

13. State and use the congruence properties for triangles (SSS, SAS and ASA) and the similarity properties for triangles (SSS, SAS and AA).

14. Use triangle congruence and similarity properties to solve problems and to prove results about other geometric shapes (e.g., squares, rectangles, parallelograms, kites, etc.).

15. Apply Basic Euclidean Constructions to construct objects such as medians, altitudes, perpendicular bisectors of the sides and bisectors of the angles for a given triangle, regular polygons, line segments with length "square root of n".

16. Determine all axes of reflection symmetry and/or describe the rotation symmetries of a given two-dimensional shape.

17. Describe and apply transformations in a variety of settings, including problem solving.

CLASS GOALS AND FORMAT: This is a mathematics content course intended to deepen and strengthen the mathematical background of prospective elementary school teachers. The course is designed to help students to improve their mathematical communication skills, ability, and comfort level with solving all types of problems. Although a variety of teaching techniques will be modeled in the classroom, this course will not specifically focus on how mathematical concepts are taught or learned.

As a teacher, you will need to understand mathematical concepts deeply enough to be able to read and correctly interpret your district or schools curriculum materials, the Common Core State Standards for Mathematics (CCSSM), and materials related to these and other sets of standards. You will need to be able to answer children’s questions, correct their misperceptions and appreciate their alternate ways of approaching and understanding the concepts that you will be teaching. You will need to have an appreciation of the trajectory of mathematical learning that they will encounter. Not only do you need to fully understand the material you will present, you need to also understand how what the students learned previously, and how they learned it, will affect their ability to understand what you are teaching. In addition, you need to have a clear and deep understanding of how what you do in your classroom will impact your students in the future.

Each day in class will consist of short lectures and in-depth in-class activities in a professional workshop format. Regular attendance, preparation for class, and active participation are required components of the course. You will be expected to arrive on time prepared to work actively, co-operatively, and enthusiastically in small groups on a daily basis. Your peers will be relying on you to offer your ideas and provide feedback. You need to be prepared to discuss and reflect on your reading and homework assignments demonstrating critical, analytical and reflective processes. This aspect of our course is key to mastering the Baccalaureate Core learning outcome: “Critique the applicability of a mathematical approach or the validity of a mathematical conclusion”, as it requires you to actively engage in this type of mathematical work in class every day. You will be graded on your class participation each day.

EVALUATION OF STUDENT PERFORMANCE: Your grade for this course will be determined by your scores in the following areas: exams, in-class activities, homework, projects and reflective writing. The points will be distributed as follows:
Midterm Exams  (2 @ 100 points each)  200 points
Final Exam  150 points
In-Class Work  (18 @ 5 pts)  90 points
Homework checks  (10 @ 4 pts)  40 points
Quizzes  (best 6 of 7, @ 15 pts)  90 points
Projects  (2 @ 25 pts each)  50 points
Reflective writing  (2 @ 15 points each)  30 points
TOTAL  650 points


IMPORTANT NOTE: To receive a grade of C or above you also must have earned at least 65% of the possible exam points (points 210). To receive a D or above you must have earned at least 58% of the possible exam points (203 points). You will receive the grade that you have earned by the end of the term. NO INCOMPLETES WILL BE GIVEN

EXAMINATIONS: There will be two Midterm Exams (100 points each) and a cumulative Final Exam (worth 150 points). The exams are primarily write-out in format and are designed in part to help your instructor assess your ability to understand, identify and use appropriate mathematical models.

READING & HOMEWORK ASSIGNMENTS: Homework assignments will be posted weekly on Canvas. These assignments list daily reading materials, exercises and problems from the text, and (sometimes) activities handed out in class. You are expected to be prepared with each day’s assignment done at the beginning of class. Homework will not be collected, however we will be checking it in class each week and you will have weekly quizzes on the covered material (details below).

HOMEWORK CHECKS: Once each week (on the days when there is neither a quiz nor a midterm) the TAs will be checking your homework. They will be looking for effort shown on every problem, and complete solutions (not just the final answer). If you are going to be absent from class on a homework check day, you may have a friend turn your homework in at the beginning of class and you will then earn full credit. Otherwise, if you are absent, you can receive half credit for the missed homework check by having a TA look at it on the day you return to class. If you miss more than one homework check day in a row, you will need to discuss late credit with me. No other late homework credit will be given.

QUizzes: There will be seven homework quizzes. Your top six of these seven scores will be counted towards your grade. For this reason, absolutely no makeup quizzes will be given. If you miss a quiz for any reason, including illness, a “0” is recorded for that quiz, and one such score will be the one that is not counted in your final grade. Since a primary objective in giving homework quizzes is to inspire you to do homework, you are allowed to use any notes you have taken or homework you have done as resource materials during the quiz. Quiz problems typically closely resemble assigned homework or class work from the previous few days.

Writing Assignments and Projects: There will be three reflective writing assignments over the course of the term. These will typically be short reflections on selected readings, your experiences and our work together. A scoring rubric will be handed out in class and posted on Canvas. Writing assignments must be typed. The two 25 point projects are designed for you to be able to explore some specific geometric and problem solving concepts in more depth. Reflections and projects are both expected to be completely professional in appearance.
LEARNING RESOURCES (required):

- Three ring binder with dividers, pencils, erasers, colored pencils or markers, ruler (marked with cm), compass, graph paper
- calculator for homework

POLICY ON CALCULATORS AND OTHER ELECTRONICS: Only basic calculators will be allowed during class work and tests. Basic calculators will be provided for use during all class and test periods. These are the type of calculators that will be available for your future students to use in the elementary classroom and it is important that you are able to do all calculator work needed during this course using only this type of calculator. Unless you get special permission from me in advance (usually only for disability accommodation), do not use laptops, tablets, phones, or other similar electronic devices in class, even for taking notes. The material we'll be covering is not conducive to electronic note-taking, and electronic note-taking in general seems to be less effective than hand-written (Mueller and Oppenheimer 2014).

STUDENTS WITH DISABILITIES: Accommodations for students with disabilities are determined and approved by Disability Access Services (DAS). If you, as a student, believe you are eligible for accommodations but have not obtained approval please contact DAS immediately at 541-737-4098 or at [http://ds.oregonstate.edu](http://ds.oregonstate.edu). DAS notifies students and faculty members of approved academic accommodations and coordinates implementation of those accommodations. While not required, students and faculty members are encouraged to discuss details of the implementation of individual accommodations.

ACADEMIC DISHONESTY: Students are expected to be honest and ethical in their academic work. Academic dishonesty is defined as an intentional act of deception in one of the following areas:

- Cheating: use or attempted use of unauthorized materials, information or study aids;
- Fabrication: falsification or invention of any information;
- Tampering: altering or interfering with evaluation instruments and documents;
- Plagiarism: representing the words or ideas of another person as one’s own;
- Assisting: helping another commit an act of academic dishonesty.

If evidence of academic dishonesty comes to my attention I will, after following the University documentation procedures, impose a grade of “F” in the course for the involved student(s). For more information about academic integrity and OSU policies and procedures in this area, visit the Student Conduct website: [http://studentlife.oregonstate.edu/studentconduct/offenses-0](http://studentlife.oregonstate.edu/studentconduct/offenses-0)

EXPECTATIONS OF STUDENT CONDUCT: You are expected to turn off your cell phone or put it on vibrate and put it away when you arrive for class. If you are texting during class, then you are not participating in your group work and will lose 2 of your participation points per time that you are reminded to put your cell phone away. You are expected to conduct yourself in a professional manner in this class. It is assumed that you will be respectful in your conversations with your classmates, with your TAs and with me. If you have a concern about an aspect of the course, please come to my office to discuss your concern. Students exhibiting disrespectful behavior will be referred to the Office of Student Conduct.
There are many resources available to help you with the study of mathematics.

Make a note of my office hours. I will be glad to help you whenever I can - just ask!

Make a note of your TA's office hours. He/she will also be glad to work with you.

I strongly recommend that you form the habit of studying together in small groups. There are many locations on campus for study groups to meet and work, for example the library or the Mathematics Learning Center. Many students find that working with other students is an effective way of doing homework, but be sure you are working together towards understanding the solution, not just "getting the answer". Often another student can explain things in terms that an instructor cannot. If you find you are doing most of the explaining in your group, remember that you often can learn concepts best by explaining them to someone else. The most successful mathematics students form study groups early and keep them throughout the term.

Walk-in tutoring (free of charge) is available in the Mathematics Learning Center (Kidd 108) and in the Library. Below is a list of hours for the Mathematics Learning Center. It is at times difficult for the tutors in the center to help with this course, since it is so different from the "usual" math classes. The TA's who help in these classes will be holding their own office hours and they should be your first choice for help in the MLC. We will be providing you with their office schedule soon.

<table>
<thead>
<tr>
<th>Mathematics Learning Center</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Where:</strong> Kidder 108</td>
</tr>
<tr>
<td><strong>Hours:</strong></td>
</tr>
<tr>
<td>MTWR</td>
</tr>
<tr>
<td>F</td>
</tr>
<tr>
<td>9:00 AM - 5:00 PM</td>
</tr>
<tr>
<td>9:00 AM - 4:00 PM</td>
</tr>
<tr>
<td><strong>Where:</strong> Library (CLC)</td>
</tr>
<tr>
<td><strong>Hours:</strong> SuMTWR</td>
</tr>
<tr>
<td>6:00 PM - 10:00 PM</td>
</tr>
</tbody>
</table>