Spring term 2014

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Email: burtonl@wou.edu                Office Hours: By appointment

Course Description:
Geometry and Measurement: K - 8 Learning and Teacher Practices (3)
This course is a deep exploration into the teaching and learning of geometry and
measurement in grades K-8. Investigation of the learning trajectory of geometry and
measurement throughout the K-8 curriculum, and instruction and activities based on
effective standards for mathematical practice will be emphasized. Attention will also be
given to deepening the candidates understanding of the mathematics and specialized
content knowledge related to the teaching of geometry and measurement as outlined in
the Common Core State Standards for grades K-8.

Also see: www.wou.edu/math/EMIL for descriptions of the 611 - 616 suite of courses.

Required Materials: Course materials and links to readings are available on the Math
613 Moodle page.

Course Structure and Delivery: This is a hybrid course, with an online component and
three on-campus meetings at WOU. Instruction will be conducted through a mix of direct
instruction, activities, readings, discussions and reflections, and analysis of elementary
school student work. On campus meetings are scheduled for:

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saturday, April 12</td>
<td>1 – 4 p.m.</td>
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<tr>
<td>Saturday, May 3</td>
<td>1 – 4 p.m.</td>
</tr>
<tr>
<td>Saturday, May 24</td>
<td>1 – 4 p.m.</td>
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Course Objectives: Students will be expected to meet the geometry and measurement
TSPC competencies as found in the Course Outcomes table at the end of this syllabus.

Coursework: This course will consist of introductory materials and activities, followed
by four learning modules, each of which is a unit consisting of mathematics instruction
and student activities. In the first portion of each learning module, students will be
expected to demonstrate a basic level of mathematics proficiency on a competency
quiz. The course will conclude with summary materials relating the four modules to the
course TSPC standards and related Common Core standards.
Course Assessment:

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proficient or better on all competency quizzes</td>
<td>Required*</td>
</tr>
<tr>
<td>Introductory and module 1 – 4 assignments</td>
<td>80%</td>
</tr>
<tr>
<td>Saturday 1 – 3 assignments</td>
<td>15%</td>
</tr>
<tr>
<td>Course summary paper</td>
<td>5%</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
</tr>
</tbody>
</table>

*-10% of course grade for every quiz not passed at proficiency level or better by the end of finals week

Letter Grades: A letter grade will be given based on the following percent scale:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>[93, 100]</td>
</tr>
<tr>
<td>A-</td>
<td>[90, 93)</td>
</tr>
<tr>
<td>B+</td>
<td>[87, 90)</td>
</tr>
<tr>
<td>B</td>
<td>[83, 87)</td>
</tr>
<tr>
<td>B-</td>
<td>[80, 83)</td>
</tr>
<tr>
<td>C+</td>
<td>[77, 80)</td>
</tr>
<tr>
<td>C</td>
<td>[73, 77)</td>
</tr>
<tr>
<td>C-</td>
<td>[70, 73)</td>
</tr>
<tr>
<td>D</td>
<td>[60, 70)</td>
</tr>
<tr>
<td>F</td>
<td>[0, 60)</td>
</tr>
</tbody>
</table>

Student Support Services: Disability Accommodation: If you have a documented learning disability, please let me know during the first few days of our course, I will be more than happy to accommodate you in any way that I can. If you have a documented disability which requires any academic accommodations, you must go to the Office of Disability Services (ODS) for appropriate coordination of your accommodations. You can drop by APSC 405 or contact ODS at (503) 838-8250 to schedule an appointment.

Veterans and Active Military Personnel with special circumstances are welcome and encouraged to communicate these, in advance if possible, to the instructor.

Incomplete Policy: An Incomplete can only be granted for a student who is passing a class and has a documented emergency that prevents them from completing the course.
### COURSE OUTCOMES

**Reference:** Knowledge, Skills and Abilities for Elementary Mathematics Instructional Leader Specialization and as specified by the publication: Standards for Elementary Math Specialists: A Reference for Teacher Credentialing and Degree Programs; a publication of the Association of Mathematics Teacher Educators.

<table>
<thead>
<tr>
<th>OREGON TSPC STANDARDS</th>
<th>AMTE-EMS STANDARD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge, Skills and Abilities for Elementary Mathematics Instructional Leader Specialization</td>
<td>Ia Deep understanding of mathematics for grades K–8</td>
</tr>
</tbody>
</table>

**Content Knowledge for Teaching: Candidates will deeply understand:**

**GEOMETRY AND MEASUREMENT**

- **Visualization:** Geometric objects are pictured on a 2-dimensional page; for 3-dimensional objects this requires perspective or projection renderings. Producing and reading such representations calls for special skills, both mathematical and drawing.

- **Composing and decomposing:** A geometric figure can be assembled by joining together various component figures. Conversely, a geometric figure may be decomposed into pieces, for example decomposing a polygon into an assemblage of triangles.

- **Congruence and similarity:** Congruence is the basic concept of geometric “sameness.” Similarity has to do with rescaling: Two figures are similar if one of them is congruent to a rescaling of the other. For example, all circles are similar, as are all squares and all isosceles right triangles.

- **Geometric measurement:** A way of attaching a numerical quantity to a geometric figure. Doing this involves a choice of some standard figure (the “unit”) and then the measurement is a kind of ratio of the given figure to the unit, or, put differently, how many copies of the unit does it take to compose the given figure? It follows that if a geometric figure is decomposed, then its measure is the sum of the measures of its components. Changing the unit has the effect of multiplying all measurements by a constant (relating the two units). For example, relating feet to inches, or to meters.

- **Common units of geometric measurement:**
  - **Linear:** The unit may be the interval [0, 1] on the number line.
  - **Area:** The unit is a unit square.
  - **Volume:** The unit is the unit cube.
  - **Angle:** Draw a unit circle centered at the vertex of the angle, and consider the arc of the circle cut out by the angle. The radian measure of the angle is the length of that arc. The degree measure of the angle is \(360\alpha/\pi\), i.e. 360 times the fraction of the circumference of the circle formed by the arc.

- **Basic geometric figures in each dimension:**
  - **Dimension 1:** Line segments, arcs of circles.
  - **Dimension 2:** Polygons, circles.
  - **Dimension 3:** Polyhedral solids, cylinders, cones, spheres. Elements of these figures, e.g., vertex, edge, face. Properties of regularity and symmetry. Definitions, names, and classification. Various kinds of measurement, and some basic formulas; invariance under congruence, and behavior under rescaling.

- **Transformations:** Reflections, rotations, translations, dilations, glide reflections; composition of transformations; symmetry and its expression in terms of transformation (e.g., reflection through a line of symmetry); development and expression of congruence and similarity in terms of transformations.

- **Geometric constructions; Axiomatic reasoning; Proof:** Making and proving conjectures about geometric shapes and relations.

**ALGEBRA AND FUNCTIONS**

- **Modeling of problems, both mathematical and “real world,” using algebraic equations and inequalities.** (Include area, perimeter, surface area, volume, nets, angles)

**Specialized Mathematics Knowledge for Teaching: Candidates will learn to**

- **Support the development of mathematical proficiency as characterized by conceptual understanding, procedural fluency, strategic competence, adaptive reasoning, and productive disposition (National Research Council, 2001).**

- **Create opportunities for learners to develop mathematical practices and to critically evaluate their selection and use of these practices.**

- **Diagnose mathematical misconceptions and errors and design appropriate interventions.**

- **Decide whether, how and how far, to utilize specific oral or written responses from learners.**

- **Recognize, evaluate, and respond to multiple, often non-standard solutions to problems.**

- **Choose and/or design tasks to support the learning of new mathematical ideas or methods, or to test learners’ understanding of them.**

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MTH 613 syllabus, page 3