C O U R S E O U T L I N E
MT. HOOD COMMUNITY COLLEGE DISTRICT
Gresham, Oregon 97030

* New _____

*Revised _____

* Review only (no changes) 7/2007 (Date)

* COURSE TYPE Please check appropriate box:

- ☒ Lower Division Collegiate
- ☐ Occupational Supplementary
- ☐ Occupational Preparatory
- ☐ Other Education, Including General Ed & Adult Ed

COURSE TITLE Fundamentals of Elementary Mathematics III

COURSE NUMBER Mth 213 COURSE CREDIT 4

* Lecture Hours 4 | _____ Wkly/Term Lab Hours _____ | _____ Wkly/Term Seminar Hours _____ | _____ Wkly/Term

* GRADING STATUS:

☒ Letter Grade Only ☐ S/U Only ☐ Optional ☐ No Grade

* HEADCOUNT LOADING:

☐ Yes ☒ No * Factor _____

Guided Studies Requirement:
Student must be proficient in:

- ☒ Reading (RD90)
- ☒ Writing (WR90)
- ☒ Mathematics (MTH20)
- ☐ Not applicable

For Instruction Office Use Only
General Education Category
Apply general requirement or distribution to:

AA_____ AS_____ AS/OT-Bus_____

AAS_____AGS_____

VP Approval _____Date_____

Phil DeMarois	3/6/02		
1) Prepared by	Date	4) Approved by Dean	Date
2) Approved by Distance Education Admin.	Date	5) Curriculum Committee	Date
3) Approved by Department Chair	Date	6) Approved by VP for Student Learning	Date

* See legend/definition for explanation

COURSE DESCRIPTION: (for catalog)

This course is part three of the three-course sequence in mathematics for future K-8 teachers. Various concrete, pictorial, and heuristic problem solving strategies are used to explore geometry and measurement. The course includes two- and three-dimensional shapes and their properties, coordinate and transformational geometry, and standard and nonstandard measurement. A required computer component will reinforce the concepts of the course.

PREREQUISITE:
MTH 212 with a grade of C or better, or consent of instructor.

INSTRUCTIONAL MATERIALS REQUIRED OF STUDENT: (text, supplies, etc.)

Text as determined by instructor. Scientific calculator with fraction key. Protractor, compass, straightedge, graph paper, scissors, colored pencils.

STUDENT LEARNING OUTCOMES

Upon successful completion of the course, the student will be able to:

1) Communicate effectively (orally and in writing) a problem solving process, results, and conclusions using mathematical terminology and correct mathematical syntax appropriate to the level of study.

2) Apply mathematical reasoning and modeling to solve problems arising from the real world.

3) Model problem situations using mathematics verbally, numerically, visually, graphically, and/or algebraically, and make connections among the four models as appropriate at this level.

4) Determine if a solution is reasonable and verify results.

5) Describe and illustrate heuristic problem solving methods.

6) Use manipulatives to model basic concepts involving geometry and measurement.

GENERAL INSTRUCTIONAL METHODS:

The MHCC Mathematics Curriculum emphasizes conceptual understanding, real-world applications, multiple representations of problem situations, making connections, mathematical modeling and mathematical problem solving. This represents a shift away from technique mastery and procedural skills. For students to see mathematics as an integrated whole, the above objectives should be presented in a connected fashion and not treated as discrete topics or concepts.

EVALUATION PROCESS:

The instructor must consider the amount of verifiable individual work completed by the student. The instructor must give a cumulative in-class final exam to help ensure that students are truly prepared for the next course.

Grades should be based on a balanced variety of grading opportunities spread throughout the term. Although the instructor may not choose to use every method below, a variety of methods is expected. Student evaluation must include problems or activities that incorporate and integrate several outcomes, and closely resemble situations that exist in the real world.

- Projects
- In-class Individual Exams
- In-class Team exams
- Take-Home individual Exams
- Take-Home Team Exams
- Writing Assignments
- Daily Homework
- Attendance
- Teamwork/Participation
- Presentations

Math 213 Course Guide

DETAILED STUDENT LEARNING OUTCOMES/INSTRUCTOR REQUIREMENTS:
The instructor is responsible to teach and measure all of the following outcomes. Upon successful completion of this course, the student will be able to:

COURSE CONTENT

1. **Overarching Objectives**
2. **Basic Concepts**
3. **Two- and Three-dimensional Figures**
4. **Congruence Transformations**
5. **Symmetry and Tessellations**
6. **Similarity**
7. **Systems of Measurement**
8. **Perimeter and Area**
9. **Surface Area and Volume**

II. PERFORMANCE OBJECTIVES

1. Overarching Objectives

Goal: Create capable problem solvers and creative learners able to model and interpret elementary geometry concepts.

The student should be able to:

a) Communicate effectively (orally and in writing) a problem solving process, results, and conclusions using mathematical terminology and correct mathematical syntax appropriate to the level of study.

b) Apply mathematical reasoning and modeling to solve problems arising from the real world.

c) Model problem situations using mathematics verbally, numerically, visually, graphically, and/or algebraically, and make connections among the four models as appropriate at this level.

d) Determine if a solution is reasonable and verify results.

e) Describe and illustrate heuristic problem solving methods.

f) Use manipulatives to model basic concepts involving geometry and measurement.

2. Basic Concepts

Goal: Build familiarity with basic plane geometry concepts involving points, lines, and planes.

The student should be able to:

a) Define and identify points, lines, line segments, rays, angles, and planes.

b) Classify angles by size.

c) Measure angles.

3. Two- and Three-dimensional Figures

Goal: Build familiarity with the classification and properties of two- and three-dimensional figures.

The student should be able to:

a) Define polygon, congruence, triangle, quadrilateral, pentagon, hexagon, octagon, trapezoid, parallelogram, rectangle, rhombus, square, regular polygon, convex polygon, and concave polygon.

b) Classify triangles.

c) Classify quadrilaterals.

d) Describe corresponding angles and alternate interior angles.

e) Determine the measures of central angles, vertex angles, and exterior angles of regular polygons.

f) Define polyhedron and convex polyhedron.

g) Identify the faces, edges, and vertices of a polyhedron.

h) Describe and identify prisms, pyramids, and regular polyhedra.

i) Describe and identify cylinders, cones, and spheres.

j) Identify the five regular polyhedra: tetrahedron, octahedron, icosohedron, cube, and decahedron.

k) Illustrate Euler's formula for convex polyhedra.

4. Congruence Transformations

Goal: Build familiarity with the concept of congruence and its uses.

The student should be able to:

a) Define congruence.

b) State and apply the SAS, ASA, and SSS congruence properties.

c) Describe translation, rotation, reflection, and glide reflection.

d) Given a figure in the plane and using appropriate tools, find the image under a translation, a rotation, a refection, and a glide reflection.

e) Determine if two triangles are congruent by finding a distance preserving transformation that takes one triangle to the other.

5. Symmetry and Tessellations

Goal: Build familiarity with the various symmetries and techniques for tessellating the plane.

The student should be able to:

a) Describe and recognize translation symmetry, rotation symmetry, reflection symmetry, and glide reflection symmetry.

b) Describe what a tessellation of the plane is using polygons.

c) Show that any triangle and any quadrilateral will tessellate the plane.

d) Determine when a polygon will tessellate.

e) Define and illustrate the vertex figures of a tessellation.

f) Define and illustrate a semiregular tessellation.

g) Create tessellations of the plane using given figures.

6. Similarity

Goal: Build familiarity with the concept of similarity and its uses.

The student should be able to:

a) Define similarity.

b) Use similar triangles to solve applied problems.

c) Describe the meaning of magnification.

d) Determine if two triangles are similar.

e) Find magnification images for plane figures, given the center and scale factor of the magnification.

f) Determine a combination of motions and magnifications that will demonstrate the similarity of a given pair of figures.

7. Systems of Measurement

Goal: Build familiarity with what it means to measure and basic systems used to measure.

The student should be able to:

a) Describe and illustrate dimensions and corresponding units.

b) Describe the measurement process.

c) Demonstrate what is meant by informal measurement using nonstandard units.

d) Describe the characteristics of an ideal system of units.

e) Describe the key features and basic units of the metric system.

f) Discuss the meaning of precision and accuracy in measurement.

8. Perimeter and Area

Goal: Build familiarity with basic ideas and formulas for measuring perimeter and area.

The student should be able to:

a) Define perimeter, area, and circumference.

b) Differentiate between perimeter and area.

c) Describe how to find areas and perimeters of polygons on geoboards and dot paper.

d) Demonstrate how to develop area and perimeter formulas for rectangles, parallelograms, triangles, and trapezoids.

e) State, justify, and apply the Pythagorean Theorem.

f) Demonstrate how to develop area and circumference formulas for circles.

9. Surface Area and Volume

Goal: Build familiarity with basic ideas and formulas for measuring surface area and volume.

The student should be able to:

a) Define and explain the basic concepts of surface area and volume.

b) Determine the surface area of prisms, pyramids, cylinders, cones, spheres, and other solids composed of these shapes.

c) Develop the volume formula for a box by filling it with cubes.

d) Justify volume formulas for prisms, cylinders, and spheres.

e) Determine the volume of prisms, pyramids, cylinders, cones, spheres, and other solids composed of these shapes.

GENERAL INSTRUCTIONAL METHODS:

The MHCC Mathematics Curriculum emphasizes conceptual understanding, real-world applications, multiple representations of problem situations, making connections, mathematical modeling and mathematical problem solving. This represents a shift away from technique mastery and procedural skills. For students to see mathematics as an integrated whole, the above objectives should be presented in a connected fashion and not treated as discrete topics or concepts.

Calculator: The calculator is required for the course to support a focus on conceptual understanding and applications rather than emphasizing algorithms. The calculator should be used as a tool to clarify material and speed computation, not as a substitute for explaining the reasons behind the mathematics. Estimating skills (without the calculator) and reality checks should be emphasized to verify calculator results. In addition, technology is a component of the real world for which we are preparing our students. We must encourage technological as well as mathematical literacy.

Language: Use the language of mathematics. For example, refer to the denominator of a fraction as the denominator more and more frequently through the term (rather than as the "bottom").

Learning Environment: Students learn in many different ways: by writing, by listening, by discussing, by asking, by explaining, by reading, etc. The classroom should be structured to support these many learning styles. Since this course is designed for future teachers, it is critical that the instructor model exemplary teaching practices. Thus, teaching should involve a variety of presentations including such methods as:

- Activity Follow-Ups
- Assessment (for teacher information)
- Cooperative Team Problem Solving/Applications
- Data-Gathering Experiments
- Evaluation (graded work)
- Games with an Objective
- Guided Discovery Activities
- Hands-on Activities
- Interactive Lecture
- Lecture
- Questions & Answers on Homework
- Reviewing Evaluation Efforts/Feedback
- Student/Team Presentation of Homework
- Student/Team Presentations
- Team Discussions
- Team-Building Activities
- Team-work at Blackboards
- Use of Technology
- Whole-Class Discussions

In addition, out of class work should also include a variety of learning approaches including:

- Daily Homework
- Hands-On Measurement/Data Gathering
- Individual Evaluation
- Out-of-Class Team Activities (limited)
- Reading Textbook
- Research
- Team Collaboration (Phone, Meetings, etc.)
- Team-Based Evaluation
- Writing Assignments

The classroom should be a cooperative environment managed by the instructor, but focused on the students. Thus, neither a complete lecture format nor a team-based classroom left alone is a successful model. Balance of learning environments and instructor supervision and contribution are necessary components. Although the balance of activities in a classroom varies between instructors, a successful learning environment will certainly include the following essential components:

- **Problem solving activities** must be provided for the students to develop and apply a variety of strategies to solve problems, verify and interpret results with respect to the original problem situation, and generalize solutions and strategies to new problem situations. Through this experience students acquire confidence in using mathematics meaningfully and are able to formulate and solve problems as they exist in the real world and in their field or area of interest.
- Concepts presented in a class should be connected to the **students' future role as educators**.
- **Guided discovery** learning activities must be provided to help the student take responsibility for his/her learning and develop a mechanism to "learn how to learn." By investigating patterns and exploring concrete, pictorial, and graphical models, students create their own understanding of mathematical concepts. Discovery activities also teach students to be adventuresome in their approach to problems - that they need not know the answer before beginning to try something. Manipulatives must be available to aid guided discovery learning activities.
- **Teams** should be constructed to best allow for whole team discussion without any students being left out. Teams should work together in class most days on tasks furthering their understanding of the material and their problem solving/communication abilities. Most discovery activities are completed in teams. (It is recommended that teams be comprised of no more than five students due to the tables used in our classrooms.)
- Although teams are an extremely important and valuable learning environment, they cannot replace **whole class discussions** where students share their insights in an interactive lecture with the instructor as the knowledgeable authority. Team activities (especially discovery activities) need to be followed by a discussion/lecture to ensure that all students understand the material.
- To help coordinate these follow-up efforts and to ensure that the class is learning the material, the instructor should be constantly **assessing** their progress while students are working in teams. Teamwork is not a break for the instructor. The instructor needs to be available to answer questions, sometimes guide discussions, facilitate good team behaviors as needed, and gather information about the students' comprehension and ideas.

  This type of assessment will help the instructor select and set up the next learning environment wisely (or adjust the current one as necessary). As students are working on an activity, the instructor may realize that some instructor-led discussion is necessary in the middle rather than just at the end (as might have been planned). The instructor can use observations to decide whether the instructor should follow a team problem solving session with a class discussion, a lecture, or by having each team put their solution on the board and giving the teams an opportunity to present their approaches. Flexibility is an extremely important part of teaching in a student-centered learning environment.

Although flexibility is important, the instructor must remember that the course outline must be covered by the end of the term. Sometimes the instructor may need to leave a topic that students are not comfortable with and continue covering material. It is important to spiral back and address these weaker points as the term continues.

EVALUATION PROCESS:

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