Spring 2-1-2022

M 133.01: Geometry and Measurement for Elementary School Teachers

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Credits: 3
Course Start/End Date: 18Jan-6May
Course Location/Days/Times: LA102 MWF 9-9:50
Required [and/or Recommended] Textbook(s): Beckmann, S., et.al., *Mathematics for Elementary Teachers (with activities)* (5th ed.).
Required Materials and Aids:

> **Journal:** Have a source to capture key ideas and new concepts that you want to remember for your experience as a teacher. It is well documented that students ``lose'' about 80% of what is learned and are exposed to in most classes within a year of the conclusion of the course. Capturing important information in a written format will help you recall them later when you're preparing for your students.
> **Geometry tools:** Compass and straightedge
> **Graph paper:** Many students may find graph paper useful as well.

INSTRUCTOR INFORMATION

Instructor: Rick Darnell
Phone Number: 406-243-6812
College e-mail Address: Richard.Darnell@umontana.edu
Official Course-related Website: Moodle
Office Hours/Availability to Students: Check my faculty page for posted office hours.
Office Location: Math 004C

COMPUTER REQUIREMENT
Student ownership of and/or permanent access to a computing device is required for online homework (MyMathOnline), other assignments and projects (Moodle), and access to Perusall (through Moodle)

COURSE CONTENT

Course Description: The study of geometry and geometric measurement for prospective elementary and middle school teachers, including synthetic, transformational, and coordinate geometry, constructions, congruence and similarity, 2-dimensional and 3-dimensional measurement, and problem solving.

Course Learning Outcomes:
To help meet the need for effective teaching knowledge, students successfully completing this course will continue their personal development of a profound understanding of fundamental mathematics, and will be able to:

1. Analyze characteristics and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships;
1. Apply transformations and use symmetry to analyze mathematical situations;
2. Use visualization, spatial reasoning, and geometric modeling to solve problems;

3. Describe and apply measurable attributes of objects and the units, systems, and processes of measurement;
4. Apply appropriate techniques, tools and formulas to determine measurements for length, area, and volume;
5. Develop a deep understanding of the mathematical concepts needed for effective teaching by developing the ability to examine and explain underlying mathematical structure in using multiple geometric representations and tools for solving problems.
6. Describe the influence of geometry and logic on Western civilization.

Upon completion of the mathematical literacy requirement, a student will be able to apply effectively mathematical or statistical reasoning to a variety of applied or theoretical problems.

Course Schedule/Topical Outline:
Course schedule is subject to change based on the needs of the course. Official course schedule is located in Moodle*. *Any revisions to course schedules will be posted in Moodle.

Topic 1: Introduction = First words on logic, proof, geometry from Euclid and Plato, and Western philosophy.
Topic 2: Measurement = What is measurement, error and precision, conversions
Topic 3: Back to Euclid = Lines and angles, triangles and other polygons, and circles and spheres.
Topic 4: Area and volume of shapes = Riemann's approximation, derivation of the meaning of area and volume, and their formulas.
Topic 5: Geometry of motion and change = translations, tessellations, and other moving pictures.

Course schedule and critical dates are subject to change based on the needs of the course, announced on Moodle and in class.

Grade Calculation Procedure (Assessments):
Part of your letter grade in the course will be determined by assessment of your understanding of predetermined learning standards (posted on Moodle). For each standard, you will complete an assessment that will provide me with the ability to assess your understanding on a 4-point scale according to:

Score:	Student demonstrates…	Classification
4	mastery beyond learning target	Beyond proficient
3	full mastery of the learning target	Proficient
2	partial mastery of the learning target	Nearing proficient
1	minimal mastery of the learning target	Novice
0	no mastery of the learning target	Beginner

We will assess standards periodically through a variety of methods, including assessments and projects. You will have the opportunity to "challenge" and improve your assessment results during the semester. Your grade for this portion will be an average of your scores on the assessment, which will then be assigned a percentage based on the GPA-to-percent scale.

Grade Calculation Procedure (Discourse): Discourse in a math class helps us to explain our thoughts and understandings, and to learn from the thoughts and understandings of others. This semester, we will be trying a tool called Perusall (available as a link from Moodle) to foster discourse. Readings will be posted on Perusall, and you will be expected to read, comment, question, and respond to the comments and questions of others for each reading. Perusall will automatically give you "points" based on the quality and nature of your discussions.

Grade Calculation Procedure (Homework): To help you with the "mechanics" of various geometric ideas and applications, we will be using MyOpenMath as an online homework portal. There will be multiple assignments for each topic.

Grading Scale:
Assessments = 40% of your grade
Discourse = 25% of your grade
Homework = 15% of your grade

We will use the standard 90-80-70-60 grading scale for final course grades.

Equity and Opportunity:
Students and faculty each have responsibility for maintaining an appropriate learning environment. Those who fail to adhere to such behavioral standards may be subject to discipline in accordance with the Student Code of Conduct. Professional courtesy and sensitivity are especially important with respect to individuals and topics dealing with differences including, but not limited to race, ethnicity, nationality, culture, religion, politics, veterans status, sexual orientation, gender, gender identity/expression, age, or disability. Class rosters include students' legal names, but I will gladly honor your request to address you by an alternate name or preferred gender pronoun.

Classroom Behavior/Expectations:
Students meeting on campus should adhere to all campus health and safety regulations. Students are expected to treat each other with respect, and limit comments to those pertaining to the subject at hand.

Extra Credit/Late Work Policy:
Late work is only accepted at the discretion of the instructor. Extra credit, as a general rule, is not accepted. Extra credit opportunities will be announced in class as appropriate.

Attendance and/or Participation Requirements:
Presence is expected at all class periods. If you're not here, you lose out on a vital piece of learning in the discussions of your classmates. Please see the comments about Perusall and mathematical discourse.

Resources:
In addition to the required textbook, we will also use two outside resources:
- Perusall: An online tool for reading and commenting on texts. You will be scored on the number and quality of posts you make, in addition to the responses you make to others. In

general, each assigned reading requires at least 7 activities (posting and/or responding) to meet the full requirements of participation. Please check the introduction on Perusall through Moodle for more information.

- MyOpenMath: Online homework, which will cover some of the more "mechanical" pieces of geometry problems and applications of what we learn in class.

Testing:

Standards assessments will be administered through the Math Learning Center. Please plan accordingly, as they may not have the capacity to work with students needing to take a lot of tests at once. The more you attempt and pass earlier in the semester, the easier your life will be at the end. Assessment availability will be announced in class.

Official (Email) Communication:

All official student email correspondence be sent only to a student's university email address and that faculty and staff consider email from students' official *only* if it originates from their university account. Official notifications and course evaluation surveys will be sent to students through this account, as well.

Incomplete (I) Grades:

You must meet these conditions for an incomplete:

1. Attendance greater than 80% and a passing grade (C or better) up to 3 weeks before the semester ends; and
2. Inability to complete the course due to extenuating circumstances, which usually means serious illness or death in the family; and
3. A written agreement on how the course requirements will be completed within 12 months. If the incomplete will automatically revert to the grade assigned at the time of the incomplete.

Incompletes are only given at the discretion of the instructor, per University of Montana policies and procedures. See the current catalog for further information.

Important Dates:

- Jan. 26: Last day to add/drop, or change grading option on CyberBear
- Feb. 7: Last day to drop on Cyberbear with refund. Last day to withdraw from all classes with a partial refund. Last day to buy or refuse UM student health coverage.
- Mar. 29: Last day to drop with instructor and advisor approval in CyberBear ($10 fee applies). Last day to change grading options using CyberBear.
- Mar. 30 2 - May 6: Drop using the Course Add/Change/Drop link with instructor and advisor permission ($10 fee applies). A "WP" or "WF" will appear on the transcript. Change grading options using Course Add/Change/Drop link.
- May 6: Last day of class
- May 20: Grades posted to CyberBear!

University Holidays (no school, campus closed):

- February 21: Presidents' Day
- March 21-25: Spring Break.

Misconduct:
All students must practice academic honesty. Academic misconduct is subject to an academic penalty by the course instructor and/or a disciplinary sanction by the University. All students need to be familiar with the Student Conduct Code.

Disability modifications:
The University of Montana assures equal access to instruction through collaboration between students with disabilities, instructors, and Office for Disability Equity. If you think you may have a disability adversely affecting your academic performance, and you have not already registered with ODE, please contact them in Lommasson Center 154 or call 406.243.2243. I will work with you to provide an appropriate modification.

Disclaimer Regarding Changes to Syllabus:
This syllabus is subject to change as deemed necessary by the instructor to fulfill the changing needs of the class. Changes to the syllabus will be posted/located on Moodle.

Bibliography:
Beck, M., & Geoghegan, R. (2010) *The art of proof: Basic training for deeper mathematics.* Springer.
Van Brummelen, G., & Kinyon, M. (2005) *Mathematics and the historian's craft: The Kenneth O. Mays lectures.* Springer.