Component Area Option (a): Mathematics/Reasoning - MATH - 1312

Restricted Use - AR -UGRD Course - REVISE existing Core Course <or> Revise existing non-core course to ADD to Core

General Information

Please use this form to:

- **REVISE** a course that is already on the Core course list.
- **ADD** to the Core course list an existing permanent course that is not already on the Core course list

Course Ownership

Department* **Department of Mathematics**

Will the course be cross-listed with another area?* ○ Yes ◉ No

If "Yes", please enter the cross-listed course information (Prefix Code Title)

Implementation

Academic Year to begin offering course:* ◉ 2015 ○ 2016 ○ 2017

Term(s) Course will be TYPICALLY Offered:* ☑ Fall (including all sessions within term) ☑ Spring (including Winter Mini all sessions within term ☑ Summer (including Summer Mini and all sessions within term)

Justification for changing course

Justification(s) for Adding Course* **1. REVISE EXISTING non-CORE COURSE ADD TO CORE**

Justification "Other" if selected above:

Importing course information for revising existing Core course

Instructional Area/Course Prefix* MATH

Course Number* 1312

Long Course Title* Introduction to Mathematical Reasoning

Short Course Title

Instruction Type and Student Contact Hours

Instruction Type* **Lecture ONLY**

Contact Hours

Student Contact Hours are determined by a number of factors, including instruction type, and are used to determine the accuracy of credit hours earned by accrediting agencies and THECB. Please contact your college resource for assistance with this information.

Student Contact Hours must match the instruction type.
Eg: If Lecture ONLY, then Student Contact Hours for Lab must be zero.
Eg: If Lab ONLY, then Student Contact Hours for Lecture must be zero.

Lecture* 3

Lab* 0

Grade Options

Grade Option* **Letter (A, B, C.....)**

CIP Code

The CIP Code is used by the university and the THECB to determine funding allocated to the course, which means that selecting the most helpful valid code may have an effect on your course.

If assistance is needed with code selection, please contact your college resource.

CIP Code Directory: http://www.txhighereddata.org/Interactive/CIP/

CIP Code must use this format:
##.####.## ##

Course Repeatability

Can this course be repeated for credit?* Yes No

If Yes, how often and/or under what conditions may the course be repeated?

CIP Code* 27.0101.00 01

Catalog Descriptions

Prerequisite(s):* credit for or placement out of MATH 1310 or MATH 1311

Corequisite(s)

Course Description*

Principles of logic and proof, set theory, formal and informal geometry.

Course Notes May not apply to course or gpa requirements for a major or minor in natural sciences and mathematics.

Authorized Degree Program(s)

Impact Report *

Prerequisite:	MATH 2303 - Concepts in Algebra
	MATH 3303 - Elements of Algebra and Number Theory
	MATH 3304 - Elements of Mathematical Analysis
	MATH 3305 - Formal and Informal Geometry
	MATH 3306 - Problem Solving in Mathematics
	MATH 3307 - Statistical Applications
Programs	Bilingual Elementary Teaching and Curriculum Degree Plan
	Elementary Teaching Curriculum Degree Plan
	Human Development and Family Studies EC-6 Generalist
	Middle School Teaching and Curriculum, ELA Degree Plan
	Middle School Teaching and Curriculum, Math Degree Plan
	Middle School Teaching and Curriculum, Science Degree Plan
	Middle School Teaching and Curriculum, Social Studies Degree Plan

Core Curriculum Information

For additional guidance when developing course curriculum that will also meet the Core Curriculum requirements, please refer to the Undergraduate Committee website for Core Curriculum:

http://www.uh.edu/undergraduate-committee/doc_2014-core-review.html

Therein you will find a chart for the required and optional competencies based on the Core Component Area (Core Category) selected.

Component Area for which the course is being proposed (select one)*	**Component Area Option (a): Mathematics/Reasoning**
List the student learning outcomes for the course*	Students will be able to: Define and use logical reasoning and valid statements to develop formal proofs. Define and construct lines, rays, and angles given a set of conditions. Understand geometrical foundations and fundamental postulates. Use and define angle types and relationships. Define the parts of a direct proof and write a formal geometric proof. Define and construct perpendicular lines, and use the parallel postulate. Define conditional, converse, inverse and contrapositive and write an indirect geometric proof. Classify triangles and construct different types of triangles. Define properties of convex polygons and construct convex polygons. Define symmetry with respect to a line and a point and use transformations on geometric figures. Prove and define congruent triangles and congruent parts of triangles. Define and use isosceles triangles Define and use triangle inequality theorems. Define and use the properties of parallelograms and kites. Define and use the properties of various quadrilaterals. Understand and use ratios, rates, and proportions in geometry. Define and prove similar triangles and polygons. Use the Pythagorean theorem and define special right triangles. Define and construct circles and related segments.

Define and construct locus of points and concurrent lines of a triangle

Find the area and perimeter of various polygons

Define and use properties of regular polygons.

Find the area and volume of prisms and pyramids.

Find the area and volume of cones and cylinders

Define properties of polyhedrons and use Euler's Formula.

Competency areas addressed by the course*

Communication Skills

Critical Thinking

Empirical & Quantitative Skills

Because we will be assessing student learning outcomes across multiple core courses, assessments assigned in your course must include assessments of the core competencies. For each competency selected above, indicated the specific course assignment(s) which, when completed by students, will provide evidence of the competency.

Provide (upload as attachment) detailed information, such as copies of the paper or project assignment, copies of individual test items, etc. A single assignment may be used to provide data for multiple competencies.

Critical Thinking, if applicable

Virtually every question asked requires critical thinking. Of the examples in the attached syllabus, 1.3. 2.1, 2.3, 3.1(b), 4.2, 5.3, etc all examine mathetical critical thinking.

Communication Skills, if applicable

Proofs are a large part of this class which require particular communication skills. Some examples in the attached syllabus include 1.1, 1.5, 1.7, 2.2, etc all require communication skills.

Empirical & Quantitative Skills, if applicable	As a lower-division math class, the fundamental skills required are quantitative. Virtually all examples in the attached syllabus required some form of quantification.
Teamwork, if applicable	
Social Responsibility, if applicable	
Personal Responsibility, if applicable	

Syllabus

Syllabus* ✓ Syllabus Attached

Will the syllabus vary across multiple section of the course?* Yes * No

If yes, list the assignments that will be constant across sections

Important information regarding Core course effectiveness evaluation:

Inclusion in the core is contingent upon the course being offered and taught at least once every other academic year. Courses will be reviewed for renewal every 5 years.

The department understands that instructors will be expected to provide student work and to participate in university-wide assessments of student work. This could include, but may not be limited to, designing instruments such as rubrics, and scoring work by students in this or other courses. In addition, instructors of core courses may be asked to include brief assessment activities in their course.

Additional Information Regarding This Proposal

Comments:

Math 1312: Introduction to Math Reasoning
Course Syllabus

Section number: This information applies to ALL face-to-face sections
Delivery format: face-to-face lecture

Prerequisite: credit for or placement out of **MATH 1310** or **MATH 1311**

Textbook: *Elementary Geometry for College Students* by Alexander and Koeberlein, 5th edition

The information contained in this class outline is an abbreviated description of the course. Additional important information is contained in the departmental policies statement at http://www.math.uh.edu/~dog/13xxPolicies.doc and at your instructor's personal webpage. You are responsible for knowing all of this information.

Upon successful completion of this course, students will be able to use the basics of proving theorems and argue a point of view effectively. The topics lend themselves to learning the methods of proving an assertion. The course is designed for pre-service elementary and middle school teachers.

A student in this class is expected to complete the following assignments:
1 3 Regular Exams
2 Final Exam
3 Online Quizzes – one per week.
4 Homework – on each section of the textbook covered in class
5 Poppers – in-class quizzes given daily starting the 3rd week of classes.

- Homework 10%
- Poppers 10%
- Quizzes 10%
- Tests 51% (17% each)
- Final Exam 19%

Total: 100%

Some learning materials are found online on the CourseWare site at www.casa.uh.edu. Students are required to purchase an access code at the Book Store to access the learning materials.

Introduction to Mathematical Reasoning Topic List

Chapter 1 —Line and Angle Relationships

1.1 Sets, Statements and Reasoning
1.2 Informal Geometry and Measurement
1.3 Early Definitions and Postulates
1.4 Angles and Their Relationships
1.5 Introduction to Geometric Proof
1.6 Relationships: Perpendicular Lines
1.7 The Formal Proof of a Theorem

Chapter 2 — Parallel Lines

2.1 The Parallel Postulate and Special Angles
2.2 Indirect Proof
2.3 Proving Lines Parallel
2.4 The Angles of a Triangle
2.5 Convex Polygons
2.6 Symmetry and Transformations

Chapter 3 —Triangles

3.1 Congruent Triangles
3.2 Corresponding Parts of Congruent Triangles
3.3 Isosceles Triangles
3.4 Basic Constructions Justified
3.5 Inequalities in a Triangle

Chapter 4 — Quadrilaterals

4.1 Properties of a Parallelogram
4.2 The Parallelogram and Kite
4.3 The Rectangle, Square and Rhombus
4.4 The Trapezoid

Chapter 5 — Similar Triangles

5.1 Ratios, Rates and Proportions
5.2 Similar Polygons
5.3 Proving Triangles Similar
5.4 Pythagorean Theorem
5.5 Special Right Triangles
5.6 Segments Divided Proportionally

Chapter 6 — Circles

6.1 Circles and Related Segments and Angles
6.2 More Angle measures in a Circle
6.3 Line and Segment Relationships in the Circle
6.4 Some Constructions and Inequalities for the Circle

Chapter 8 — Areas of Polygons and Circles

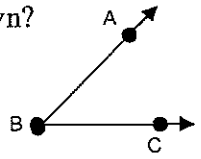
8.1 Area and Initial Postulates
8.2 Perimeter and Area of Polygons
8.3 Regular Polygons and Area
8.4 Circumference and Area of a Circle
8.5 More Area Relationships in the Circle

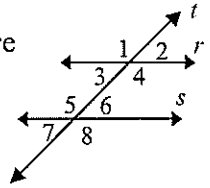
Chapter 9 — Surfaces and Solids

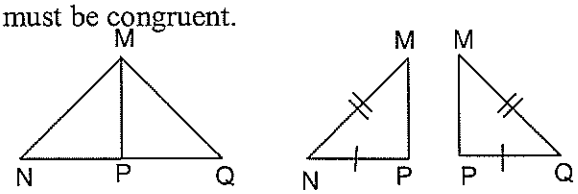
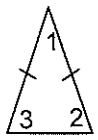
9.1 Prisms, Area and Volume
9.2 Pyramids, Area and Volume
9.3 Cylinders and Cones
9.4 Polyhedrons and Spheres

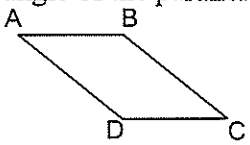
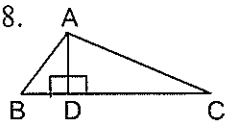
MATH 1312 Syllabus

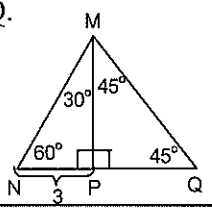
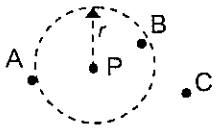
Course Objectives

Chapter.Section	Objective and Example	Material Covered
1.1	**Define and use logical reasoning and valid statements to develop formal proofs.** Example: Given the statement "If the diagonals of a parallelogram are perpendicular, then the parallelogram is a rhombus", state the hypothesis and the conclusion.	Week 1
1.2	**Define and construct lines, rays, and angles given a set of conditions.** Example: Which symbols correctly name the angle shown?  a) <ABC b)<ACB	Week 1
1.3	**Understand geometrical foundations and fundamental postulates.** Example: Given M is the midpoint of the line AB, AM=$2x$ + 1 and MB=$3x$ -2, find x and AB.	Week 1
1.4	**Use and define angle types and relationships.** Example 1: What *type of angle* is each of the following and what *relationship*, if any, exists between the two angles? a) 37° b) 143°	Week 2
1.5 1.7	**Define the parts of a direct proof and write a formal geometric proof.** Example 1: *Given:* D-E-F on line DF Make a drawing and state a conclusion based on the Segment-Addition Postulate Example 2: Complete a formal two-column direct proof of the following theorem, "If two lines intersect, the vertical angles formed are congruent."	Week 2 Week 3

Chapter.Section	Objective and Examples	Material Covered
	Define and construct perpendicular lines, and use the parallel postulate.	
1.6	Example 1: *Given:* Point N on line *s* *Construct:* Line *s*, point N, and line *m* through N so that *m* is perpendicular to line *s*.	Week 3
2.1	Example 2: Suppose that *r* is parallel to *s* in the figure shown and m<2=87°.  Find a) m<3 b) m<6	Week 4
2.3	Example 3: Determine the value of *x* so that line *r* will be parallel to line *s* in the figure shown given that m<4 = 5*x* and m<5 = 4(*x* + 5).	Week 4
	Define conditional, converse, inverse and contrapositive and write an indirect geometric proof.	
2.2	Example 1: Write the converse, the inverse, and the contrapositive of the statement, "Two angles are complementary if the sum of their measures is 90°." Example 2: Which one of the following statements would you prove by the indirect method? a) In triangle ABC, if m<A is greater than m<B, then AC will not equal BC. b) If $(x+2)\cdot(x-3)=0$, then $x=-2$ or $x=3$.	Week 4
	Classify triangles and construct different types of triangles.	
2.4	Example: Draw, if possible, an a) isosceles obtuse triangle. b) equilateral right triangle.	Week 5
	Define properties of convex polygons and construct convex polygons.	
2.5	Example: The face of a clock has the shape of a regular polygon with 12 sides. What is the measure of the interior and exterior angle formed by two consecutive sides?	Week 5

Chapter.Section	Objective and Examples	Material Covered
2.6	**Define symmetry with respect to a line and a point and use transformations on geometric figures.** Example 1: Which words have a vertical line of symmetry? DAD MOM NUN EYE Example 2: Given a random geometrical figure, does the following pair of transformations lead to an image that repeats the original figure? *Figure is rotated clockwise about a point 180° twice.*	Week 5
3.1 3.2	**Prove and define congruent triangles and congruent parts of triangles.** Example 1: In the figure below, the triangles to be proved congruent have been redrawn separately. Congruent parts are marked. (a) Name an additional pair of parts that are congruent by Identity. (b) Considering the congruent parts, state the reason why the triangles must be congruent.  Example 2: After proving the triangles congruent, use CPCTC to prove the following. *Given:* <MPN and <MPQ are right angles and P is the midpoint of line NQ. *Prove:* <N is congruent to <Q.	Week 6 Week 6
3.3	**Define and use isosceles triangles.** Example: Find the measure of <1 and <2 if the measure of <3 is 68° 	Week 7
3.5	**Define and use triangle inequality theorems.** Example: If possible, draw a triangle whose (a) angles measure 100°, 100°, and 60°. (b) sides measure 8, 9, and 10.	Week 7

Chapter.Section	Objective and Examples	Material Covered
	Define and use the properties of parallelograms and kites.	
4.1	Example 1: Given that m<A = $2x + 3$ and m<B = $3x - 23$, find the measure of each angle of the parallelogram ABCD shown below. 	Week 8
4.2	Example 2: A carpenter lays out boards of lengths 8 ft, 8 ft, 4 ft, and 4 ft by placing them end-to-end. (a) If these are joined at the ends to form a quadrilateral that has the 8-ft pieces connected in order, what type of quadrilateral is formed? (b) If these are joined at the ends to form a quadrilateral that has the 4-ft and 8-ft pieces alternating, what type of quadrilateral is formed?	Week 8
	Define and use the properties of various quadrilaterals.	
4.3	Example 1: Given rectangle ABCD, with AB = $2x + 7$, BC = $3x + 4$ and CD = $3x + 2$, find x and DA.	Week 9
4.4	Example 2: The state of Nevada approximates the shape of a trapezoid with these dimensions for boundaries: 340 miles on the north, 515 miles on the east, 435 miles on the south, and 225 miles on the west. If A and B are points located midway across the north and south boundaries, what is the approximate distance directly from point A to point B?	Week 9
	Understand and use ratios, rates, and proportions in geometry.	
5.1	Example: Assume that AD is the geometric mean of BD and DC in triangle ABC shown in the accompanying drawing. Find AD if BD = 6 and DC = 8. 	Week 10

Chapter.Section	Objective and Examples	Material Covered
	Define and prove similar triangles and polygons.	
5.2	Example 1: Quadrilateral MNPQ ~ quadrilateral RSTU, if MN = 5, NP = n, RS = 10, and ST = n + 3, find n.	Week 10
5.3	Example 2: Classify the following statement as true or false. *If the vertex angles of two isosceles triangles are congruent, then the triangles are similar.*	Week 10
	Use the Pythagorean theorem and define special right triangles.	
5.4	Example 1: Determine whether the triple (3, 4, 5) is a Pythagorean triple.	Week 11
5.5	Example 2: *Given*: Triangle NQM with angles shown in the drawing with line MP perpendicular to NQ. *Find*: NM, MP, MQ, PQ, and NQ. 	Week 11
	Define and construct circles and related segments.	
6.1	Example: Suppose that a circle is divided by points A, B, C, and D into four congruent arcs. What is the measure of each arc? If these points are joined in order, what type of quadrilateral results?	Week 11
	Define and construct locus of points and concurrent lines of a triangle	
7.2	Example 1: In the figure, which of the points A, B, and C belong to "the locus of points in the plane that are at distance r from point P"?  Example 2: What is the general name of the point of concurrence for the three angle bisectors of a triangle?	Week 12

	Find the area and perimeter of various polygons	
8.1	Example 1: A rectangle's length is 6 cm, and its width is 9 cm. Find the perimeter and the area of the rectangle.	Week 12
8.2	Example 2: Using Heron's Formula, find the area of a triangle whose sides measure 13 in., 14 in., and 15 in.	Week 12

Chapter.Section	Objective and Examples	Material Covered
8.3	**Define and use properties of regular polygons.** Example: Find the measure of the central angle of a regular polygon of five sides.	Week 13
9.1 9.2	**Find the area and volume of prisms and pyramids.** Example 1: How many a) vertices, b) edges (lateral edges plus base edges) and c) faces (lateral faces plus bases) does a triangular prism have? Example 2: In a pentagonal pyramid, suppose each base edge measures 9.2 cm and the apothem of the base measures 6.3 cm. The altitude of the pyramid measures 14.6 cm. Find the base area of the pyramid and the volume of the pyramid.	Week 13 Week 14
9.3	**Find the area and volume of cones and cylinders** Example: The teepee has a circular floor with a radius equal to 6 ft and a height of 15 ft. Find the volume of the enclosure.	Week 15
9.4	**Define properties of polyhedrons and use Euler's Formula.** Example: A regular polyhedron has 12 edges and 6 vertices. a) Use Euler's equation to find the number of faces. b) Use the results from part (a) to name the regular polyhedron.	Week 15