CORE CURRICULUM COMPONENT APPLICATION
Sam Houston State University

Revised October, 2012

PART I – Course Information

Course Type
☒ Existing/Restructured
☐ New Course Proposed Fall 2013
If new, have you submitted a Form B to the SHSU Curriculum Committee? ☐ Yes ☐ No

Course Prefix & Number: MATH 1314

Texas Common Course Number (TCCN Matrix): MATH 1314

Course Title: Pre-calculus Algebra

Course Catalog Description (Copy and paste from online catalog for existing courses):
Topics include a brief review of introductory algebra, variation, elementary theory of equations, functions (including exponential and logarithmic), inequalities, systems of equations, and other related topics.

Course Prerequisites: THEA score of 270 or its equivalent

Available Online?
☐ Yes, currently developed in online delivery mode
☐ Anticipated development in online delivery mode (Semester, Year:)
☒ No

Number of Sections to be Offered per Academic Year: 9

Estimated Enrollment per Section: 36

Course Level (freshman, sophomore): freshman

Designated Contact Person (for follow-up communication purposes): Dr. Rebecca Garcia

E-Mail Address: rgarcia@shsu.edu

Phone: 936-294-3520

Approvals

Department Chair: _____ Signature _____ 10-18-12 Date

Academic Dean: _____ Signature _____ 10/22/12 Date

Submit completed, signed form to Core Curriculum Committee - Box 2478 or Fax 4-1271

PART II – THECB Foundational Component Areas

See Appendix for full description of each component area.

Select Component Area: II. Mathematics

In one paragraph, describe how the proposed course will fulfill the core and skill objectives of the component area:

Precalculus algebra is the study of polynomial, exponential and logarithmic functions and their properties. In particular, students completing this course will be able to define each function in general, state properties of each (such as their domain and range), combine functions via arithmetic operations and composition, and provide examples of applications in which they are used. Implicitly, students successfully completing this course will (1) refine their understanding of key mathematical concepts such as functions and their general properties, (2) be familiar enough with these properties in order to use the functions in later courses such as calculus, and (3) learn to apply these mathematical concepts in appropriate settings.

PART III – Course Objectives & Student Learning Outcomes (SLO)

Insert the applicable course objectives stated as student learning outcomes (e.g., Students completing the course will be able to...) that support the core component area objectives. Please reference the component rubric for additional information on core component area objectives.

Objective/SLO 1:

Students successfully completing this course will gain a greater understanding of the use of algebraic, exponential, and logarithmic functions in describing natural and physical arrangements; refine pattern recognition skills via graphing these functions and verification and/or proof of identities; and reformulate real world problems into accurate mathematical expressions that can be solved. In so doing, students will have increased quantitative literacy in the logic of describing geometric arrangements using algebraic, exponential, and logarithmic functions, the patterns within the properties of these functions, and the relationships among these functions.

How will the objective be addressed (including strategies and techniques)?

Students will be exposed to the relationship between the definitions and properties of polynomial, rational, exponential and logarithmic functions and their graphical representation. In particular, students will be able to recognize an exponential function from its graph and provide its functional definition. In addition, students will be able to relate certain properties of each of

these functions to the other functions. For example, students will be able to determine which logarithmic function is the inverse of a given exponential function.

Describe how the objective will be assessed:

This objective will be assessed through embedded problems in quizzes, exams, and/or in-class worksheets. Instructors will incorporate a common subset of problem types in one of the exams of each section. As an example, instructors may include a question that requires the student to determine whether a given function is invertible, and if so provide the inverse.

Objective/SLO 2:

Students successfully completing this course will be able to state fully the definitions, properties, and uses of general polynomial, rational, exponential, and logarithmic functions. Emphasis will be placed on accurately representing given mathematical information both symbolically and graphically, with attention given to determining the domains and ranges of these functions, as well as translating between the graphical form of a function and its definition. In so doing, students will gain a greater understanding of key mathematical concepts.

How will the objective be addressed (including strategies and techniques)?

In order to fully comprehend the importance and uses of these functions, their definitions must be fully understood, in particular their domains and ranges. Simply being able to compute function values on a calculator will not provide the skills necessary to use these functions properly in calculus, much less correctly apply them when solving problems. All students will therefore be able to identify the domain, range, graph, and other fundamental properties of each of these functions.

In addition, the key uses of these algebraic and transcendental functions will be more fully understood after students are able to express information that is presented graphically or verbally as an equation involving these functions. That is, students will be able to sketch the graph of a given function or be able to describe the type of function whose graph most closely matches one that is given.

Describe how the objective will be assessed:

This objective will be assessed through embedded problems in quizzes, exams and/or in-class worksheets. Instructors will incorporate a common subset of problem types in one of the exams of each section. As an example, instructors may be asked to include a question that requires students to sketch the graph of a rational function that has a horizontal asymptote and more than one vertical asymptote.

Objective/SLO 3:

Students successfully completing this course will use appropriate technology to enhance mathematical thinking and understanding, solve problems using mathematical concepts, and judge the level of reasonability of the results. Students will learn to interpret mathematical formulas, graphs and tables and will expand their mathematical reasoning skills to develop sound mathematical arguments.

How will the objective be addressed (including strategies and techniques)?

Applications are an important part of understanding the key concepts in precalculus algebra. In particular, the applications have implicit conditions wherein these concepts make sense (e.g., a nonnegative time parameter, or production quantities within a particular range of values). Significant time will be spent on developing principle ideas arising from physics, economics, and and biology; specifically how the properties of these functions are applied to further understanding these applications. While this course will prepare students for differential calculus, not all students will proceed to calculus. Therefore, problems such as optimizing quadratic functions will be presented which do not explicity involve calculus.

Describe how the objective will be assessed:

This objective will be assessed through embedded problems in quizzes, exams and/or in-class worksheets. Instructors will incorporate a common subset of problem types in one of the exams of each section. As an example, instructors may include a question that requires the student to use the properties of quadratic functions to determine the maximum profit earned by a business given appropriate revenue and cost functions of the venture. Or perhaps students will be asked to use the principle of exponential growth to compute the amount of bacteria present at a particular time given the amounts of bacteria that are present at two distinct points in time.

Objective/SLO 4:

How will the objective be addressed (including strategies and techniques)?

Describe how the objective will be assessed:

Objective/SLO 5:

How will the objective be addressed (including strategies and techniques)?

Describe how the objective will be assessed:

PART IV – THECB Skill Objectives

Address each of the THECB skill objectives required within the component area. Explain how the skill is addressed, including specific strategies to address the skill(s). *Address ALL skill objectives associated with the selected Component Area. (See Appendix)*

1. Critical Thinking Skills: to include creative thinking, innovation, inquiry, and analysis, evaluation and synthesis of information

How will the skill be addressed (including specific strategies, activities, and techniques)?

The concept of a mathematical function is one of the most fundamental non-numeric objects in mathematics. Understanding functions and their properties is essential to learning the language of mathematics and its uses. Algebraic (polynomial and rational) and transcendental (exponential and logarithmic) functions in particular are important to fields from economics to biological and computing sciences.

Students completing this course will know the definitions, domains and ranges of the general forms of polynomial, rational, exponential and logarithmic functions. Properties such as asymptotes, boundedness and numbers of roots will be discussed at length, allowing students to relate the shapes of the graphs to the uses of each of these functions. As a direct result, students will to be able to determine which of these functions are more appropriate as a model for a given physical, biological, or economic model. For example, students will know that the decreasing exponential function with its horizontal asymptote is the best function to use as a model for radioactive decay.

In order to solve equations involving these functions, it will be necessary for students will learn the operation of composition of functions, be able to determine which functions are invertible, and be able to compute the inverse of those functions deemed invertible. Students will consequently be able to compute break-even points in business analysis, determine the half-life of radioactive elements, and compute equilibrium prices of economic models, among many other applications.

2. Communication Skills: to include effective development, interpretation and expression of ideas through written, oral and visual communication

How will the skill be addressed (including specific strategies, activities, and techniques)?

Students will develop their written, oral and visual communication skills as a natural part of the learning process of precalculus algebra. Obtaining a true understanding of algebraic and transcendental functions requires that each student works closely with graphical representations of mathematical functions and using such visual representations to communicate information about the function and its behavior through writing and speech. Students are routinely asked to explore and explain a variety of concepts and applications in writing exercises that challenge them to discuss important mathematical concepts with precision. In addition, many of the exercises task the student with translating plain language into symbolic mathematical expressions, resolving the problems algebraically, and communicating the results in plain language, either verbally or written.

Improving communication skills could be addressed in one of two ways, either in the form of class presentations or within group work. In those classrooms which implement student presentations, students will be expected to present solutions to several problems to the rest of the class on a regular basis. Solutions will be presented in both written form (on the board, in front of the room) and orally (explaining methods used and conclusions drawn). Students presenting solutions will receive immediate feedback from those students listening to the presentation.

Those classrooms not having students present their work to their classmates will use group work to address communication skills. On a regular basis (such as during weekly quizzes) the class will be partitioned into small groups of three or four students, and each group will work on either a lengthy problem or on a sequence of problems to be solved using algebraic manipulation. The groups will either be assigned by the instructor or formed by the students. Typically each student turns in her own set of solutions, requiring communication among group members which ensures complete, correct solutions.

3. **Empirical and Quantitative Skills**: to include the manipulation and analysis of numerical data or observable facts resulting in informed conclusions

How will the skill be addressed (including specific strategies, activities, and techniques)?

Students completing this course will be able to transform observable or measurable data into a mathematical model that can be used to represent the process or phenomenon from which the data was produced. Students will use the earlier mentioned critical thinking skills to ascertain which type of model is best (polynomial or exponential, for example), then use the available data to determine the relevant parameters needed for the particular function.

For example, given the size of a population at two distinct moments in time, students will be able to compute the two parameters needed for a general exponential population model. Or given the fixed and marginal costs required to produce one particular item, students will be able to determine the quadratic function that provides the total cost of producing any number of these items.

4. Teamwork: to include the ability to consider different points of view and to work effectively with others to support a shared purpose or goal

How will the skill be addressed (including specific strategies, activities, and techniques)?
This skill will not be addressed.

5. Personal Responsibility: to include the ability to connect choices, actions and consequences to ethical decision-making

How will the skill be addressed (including specific strategies, activities, and techniques)?
This skill will not be addressed.

6. Social Responsibility: to include intercultural competence, knowledge of civic responsibility, and the ability to engage effectively in regional, national, and global communities

How will the skill be addressed (including specific strategies, activities, and techniques)?
This skill will not be addressed.

PART V – SHSU Core Curriculum Committee Requirements

1. Using a 15-week class schedule, identify the topics to be covered during each week of the semester. Provide sufficient detail to allow readers to understand the scope and sequence of topics covered.

Week 1	Definition of a function and its graph
Week 2	Transformations of a function and the effect on its graph
Week 3	The algebra of functions - five operations
Week 4	Properties of functions: injectivity, surjectivity, and the existence and computation of of inverses
Week 5	Quadratic polynomials and their graphs
Week 6	The zeros of a quadratic: the remainder, rational zero, rule of signs, and boundedness theorems
Week 7	Higher-degree polynomials
Week 8	Rational functions and their asymptotes
Week 9	Exponential and logarithmic functions and their graphs
Week 10	The algebra of logarithms
Week 11	Mathematical models with algebraic and transcendental functions
Week 12	More with models
Week 13	Arithmetic and geometric sequences, both finite and infinite
Week 14	Convergence of sequences
Week 15	Infinite geometric series and their convergence

2. Attachments (Syllabus Required)

Syllabus Attached? ☒ Yes ☐ No

Other Attached? ☐ Yes ☒ No If yes, specify:

Appendix: THECB Component Area Descriptions and Skill Requirements

I. Communication (Courses in this category focus on developing ideas and expressing them clearly, considering the effect of the message, fostering understanding, and building the skills needed to communicate persuasively. Courses involve the command of oral, aural, written, and visual literacy skills that enable people to exchange messages appropriate to the subject, occasion, and audience.)

II. Mathematics (Courses in this category focus on quantitative literacy in logic, patterns, and relationships. Courses involve the understanding of key mathematical concepts and the application of appropriate quantitative tools to everyday experience.)

III. Life and Physical Sciences (Courses in this category focus on describing, explaining, and predicting natural phenomena using the scientific method. Courses involve the understanding of interactions among natural phenomena and the implications of scientific principles on the physical world and on human experiences.)

IV. Language, Philosophy, and Culture (Courses in this category focus on how ideas, values, beliefs, and other aspects of culture express and affect human experience. Courses involve the exploration of ideas that foster aesthetic and intellectual creation in order to understand the human condition across cultures.)

V. Creative Arts (Courses in this category focus on the appreciation and analysis of creative artifacts and works of the human imagination. Courses involve the synthesis and interpretation of artistic expression and enable critical, creative, and innovative communication about works of art.)

VI. American History (Courses in this category focus on the consideration of past events and ideas relative to the United States, with the option of including Texas History for a portion of this component area. Courses involve the interaction among individuals, communities, states, the nation, and the world, considering how these interactions have contributed to the development of the United States and its global role.)

VII. Government/ Political Science (Courses in this category focus on consideration of the Constitution of the United States and the constitutions of the states, with special emphasis on that of Texas. Courses involve the analysis of governmental institutions, political behavior, civic engagement, and their political and philosophical foundations.)

VIII. Social and Behavioral Sciences (Courses in this category focus on the application of empirical and scientific methods that contribute to the understanding of what makes us human.
Courses involve the exploration of behavior and interactions among individuals, groups, institutions, and events, examining their impact on the individual, society, and culture.)

Required Skill Objectives

Foundational Component Areas	Skill Objectives					
	Critical Thinking	Communication	Empirical & Quantitative	Team Work	Social Responsibility	Personal Responsibility
Communication	✓	✓		✓		✓
Mathematics	✓	✓	✓			
Life and Physical Sciences	✓	✓	✓	✓		
Language, Philosophy & Culture	✓	✓			✓	✓
Creative Arts	✓	✓		✓	✓	
American History	✓	✓			✓	✓
Government/Political Science	✓	✓			✓	✓
Social and Behavioral Sciences	✓	✓	✓		✓	

Submit completed, signed form to Core Curriculum Committee - Box 2478 or Fax 4-1271

COURSE SYLLABUS

MATH 1314
Pre Calculus Algebra
Credit: 3 semester hours
Fall 2014

Room:
Time:

Instructor:
Office:
(936) 294-
mth_***@shsu.edu
Office hours:

Course Description and Prerequisites:
see *Sam Houston State University Undergraduate Catalogue*
Mathematics Course Descriptions – shsu.edu
MTH 170 <MATH 1314> **Pre Calculus Algebra.**
[MATH 2312] Topics include a brief review of introductory algebra, variation, elementary theory of equations, functions (including exponential and logarithmic), inequalities, systems of equations, and other related topics. Prerequisites: THEA score of 270 or its equivalent. Credit 3.

Course objectives:

- Students successfully completing this course will gain a greater understanding of the use of algebraic, exponential, and logarithmic functions in describing natural and physical arrangements; refine pattern recognition skills via graphing these functions and verification and/or proof of identities; and reformulate real world problems into accurate mathematical expressions that can be solved. In so doing, students will have increased quantitative literacy in the logic of describing geometric arrangements using algebraic, exponential, and logarithmic functions, the patterns within the properties of these functions, and the relationships among these functions.
- Students successfully completing this course will be able to state fully the definitions, properties, and uses of general polynomial, rational, exponential, and logarithmic functions. Emphasis will be placed on accurately representing given mathematical information both symbolically and graphically, with attention given to determining the domains and ranges of these functions, as well as translating between the graphical form of a function and its definition. In so doing, students will gain a greater understanding of key mathematical concepts.
- Students successfully completing this course will use appropriate technology to enhance mathematical thinking and understanding, solve problems using mathematical concepts, and judge the level of reasonability of the results. Students will learn to interpret mathematical formulas, graphs and tables and will expand their mathematical reasoning skills to develop sound mathematical arguments.

Text: *College Algebra* (5th ed.)
by Mark Dugopolski
Pearson Addison Wesley, 2011
Selected topics from chapters 1 through 8

Calculator: -- A graphing calculator, such as a TI-83, or equivalent.

Attendance Policy

(see *Sam Houston State University Undergraduate Catalogue, Academic Policies and Procedures, Degree Requirements and Academic Guidelines, Scholastic Requirements, Class Attendance – shsu.edu*)
Late work is accepted for appropriate cause. Advise the instructor early, or as soon as possible, when work must be completed late. You are expected to be present for every examination. An excessive number of absences (more than 4 hours) may adversely affect your grade. The quality of your class participation is important and can impact your grade.

Assignments

Assignments may be given orally, by reference to a textbook, or with class handouts. These assignments may consist of reading, exercises, or reports (oral or written) concerning mathematical concepts and methods. Submissions should use an accepted format and style. The course grade is not assigned without consideration of the quality with which assignments are completed.

Exams, grading, and posting of grades

There will be three or four exams (including the final exam). The weighted mean score is used to determine the course grade. With rare exception, exams are weighted equally (deviations from this practice will be announced). A weighted mean of 90-100 is A, 80-89 is, at least, B, 70-79 is, at least, C, etc. No exam may be omitted. The date of an exam will be announced at least a week before that exam. Accepted statistical practices will be used to determine the course grade. Semester grades are posted by the registrar. (See also "Attendance Policy" and "Assignments" above.)

Other:

Go to http://www.shsu.edu/mailer/coursesyllabus.pdf for information concerning:
(1) students with disabilities, (2) observance of religious holy days, (3) academic dishonesty, (4) visitors in the classroom and (5) classroom decorum

Message devices should not be used in the classroom and the signal for an incoming message should not cause a distraction. Calls of high importance should be received outside the classroom. Registration with KATSAFE is highly recommended.