LSC Use Only Proposal No:	UWUCC Use Only Proposal No: 12-266
LSC Action-Date: AP-2/7/13	UWUCC Action-Date: AP-5/7/13 Senate Action Date: APP - 9/10/13

Curriculum Proposal Cover Sheet - University-Wide Undergraduate Curriculum Committee

Contact Person(s) Francisco Alarcon	Email Address falarcon@iup.edu
Proposing Department/Unit Mathematics	Phone 724-357-2608

Check all appropriate lines and complete all information. Use a separate cover sheet for each course proposal and/or program proposal.

1. Course Proposals (check all that apply)

- ☐ New Course
- ☐ Course Prefix Change
- ☐ Course Deletion
- ☑ Course Revision
- ☐ Course Number and/or Title Change
- ☑ Catalog Description Change

Current course prefix, number and full title: MATH 105 College Algebra

Proposed course prefix, number and full title, if changing:

2. Liberal Studies Course Designations, as appropriate

This course is also proposed as a Liberal Studies Course (please mark the appropriate categories below)

- ☑ Learning Skills
- ☐ Knowledge Area
- ☐ Global and Multicultural Awareness
- ☐ Writing Across the Curriculum (W Course)
- ☐ Liberal Studies Elective (please mark the designation(s) that applies – must meet at least one)
  - ☐ Global Citizenship
  - ☐ Information Literacy
  - ☐ Oral Communication
  - ☐ Quantitative Reasoning
  - ☐ Scientific Literacy
  - ☐ Technological Literacy

3. Other Designations, as appropriate

- ☐ Honors College Course
- ☐ Other: (e.g. Women's Studies, Pan African)

4. Program Proposals

- ☐ Catalog Description Change
- ☐ Program Revision
- ☐ Program Title Change
- ☐ New Track
- ☐ New Degree Program
- ☐ New Minor Program
- ☐ Liberal Studies Requirement Changes
- ☐ Other

Current program name:

Proposed program name, if changing:

5. Approvals	Signature	Date
Department Curriculum Committee Chair(s)		4/20/12
Department Chairperson(s)	Edel Reilly	4/20/12
College Curriculum Committee Chair		4/20/12
College Dean		4/20/12
Director of Liberal Studies (as needed)		5/1/13
Director of Honors College (as needed)		
Provost (as needed)		
Additional signature (with title) as appropriate		
UWUCC Co-Chairs	Gail S Sechrist	8/28/13

Liberal Studies
AUG 28 2013
Received

Received
MAY 3 2013
Liberal Studies

Received
APR 22 2012
Liberal Studies

Part II: Description of Curriculum Change

1. New Syllabus of Record

I. Catalog Description

MATH 105 College Algebra

3c-0l-3cr

Prerequisites: MATH 100 or appropriate Placement Test score or permission of the Mathematics Department Chairperson.

Note: Students may not take MATH 105 after successfully completing a calculus course or MATH 110 without the written approval of the Mathematics Department Chairperson.

Teaches students to appropriately analyze and interpret numerical, graphical, and algebraic representations to enable them to model complex situations using mathematical structures and increase their problem-solving skills. Particular focus will be given to polynomial, exponential, and logarithmic functions in order to prepare students for further study in business calculus and/or statistics.

II. Course Outcomes and Assessment (Expected Undergraduate Student Learning Outcomes – EUSLO)

The student will:

Objective 1:
Use mathematical formulas to graph and analyze polynomial, rational, exponential, and logarithmic functions.
Expected Student Learning Outcomes 1 and 2:
Informed and Empowered Learners
Rationale:
Assignments will require students to construct graphs of functions. Assignments will also require students to analyze characteristics of graphs such as domains, ranges, intercepts, maxima, minima, and increasing and decreasing intervals. Technology will be used to help students quickly generate graphs and analyze the characteristics of graphs.

Objective 2:
Construct mathematical models to represent real-world situations based on relevant numerical and graphical data. This includes the use of technology to generate 'lines of best fit' and to ensure that models represent the data.
Expected Student Learning Outcome 1 and 2:
Informed and Empowered Learners
Rationale:
Assignments will require students to create models related to business, nature, finance, and health and safety professions. Examples include: linear models related to rate, time and distance; quadratic models related to gravity and projectile motion; logarithmic models related to

earthquakes and Newton's Law of Cooling; and exponential models related to compound interest and radioactive decay.

Objective 3:
Use mathematical models to solve real-world problems utilizing both inductive and deductive reasoning methods and provide a contextual interpretation of the solution.
Expected Student Learning Outcome 1 and 2:
Informed and Empowered Learners
Rationale:
Assignments will require students to use mathematical models to solve real-world problems. Students will employ deductive reasoning to the problem solving process by evaluating specific instances of mathematical functions.

Objective 4:
Calculate the rate of change of a function and interpret its meaning.
Expected Student Learning Outcomes 1 and 2
Informed and Empowered Learners
Rationale:
Students will be able to measure how one quantity changes in response to a change in another quantity. The concept of rate of change will be used to solve geometric problems, such as curve sketching, and to convert written applied problems into mathematical models. Students will be able to relate the concept of rate of change to the concept of slope of the graph of a function.

III. Detailed Course Outline

A. Review of Basic Algebra (3 hours)
   1. Exponents, Radicals, Rational Exponents
   2. Polynomials and Factoring
   3. Rational Expressions

B. Equations and Inequalities (6 hours)
   1. Equations
   2. Setting Up Equations: Applications
   3. Quadratic Equations
   4. Other Types of Equations
   5. Solving Inequalities
   6. Equations and Inequalities Involving Absolute Value

C. Graphs (5 hours)
   1. Rectangular Coordinates; Graphs of Equations
   2. Lines
   3. Parallel and Perpendicular Lines
   4. Scatter Diagrams; Linear Curve Fitting (graphing calculator users only)
   5. Variation

D. Functions and Their Graphs (8 hours)
   1. Functions
   2. Properties of Functions
   3. Library of Functions

4. Graphing Techniques: Transformations
5. Operations on Functions; Composite Functions
6. Mathematical Models: Constructing Functions

E. Polynomial and Rational Functions (5 hours)
1. Quadratic Functions and Models (non calculator users omit curve fitting)
2. Polynomial Functions
3. Rational Functions I (can omit oblique asymptotes if desired)
4. Rational Functions II: Analyzing Graphs
5. Polynomial and Rational Inequalities

F. Exponential and Logarithmic Functions (10 hours)
1. One-to-One Functions; Inverse Functions
2. Exponential Functions
3. Logarithmic Functions
4. Properties of Logarithms; Exponential and Logarithmic Models (non calculator users omit curve fitting)
5. Logarithmic and Exponential Equations
6. Compound Interest
7. Growth and Decay; Newton's Law; Logistic Models

This syllabus covers 37 hours, leaving 5 hours for testing and/or review.

There are also 2 hours for a final exam or concluding activity.

IV. Evaluation Methods

60% Four Test (15% for each test) – Test will be given during the regular semester
20% Final Examination. The final examination will be comprehensive and cover both basic competency and critical thinking.
20% Homework, Quizzes, and Projects. These will cover textbook assignments and applications to business and economics.

V. Grading Scale

Grades will be assigned as follows:

A: 90%-100%
B: 80%-89%
C: 70%-79%
D: 60%-69%
F: 0%-59%

VI. Undergraduate Course Attendance Policy

Although there is no formal attendance policy for this class, student learning is enhanced by regular attendance and participation in class discussions. [Note: It is recommended that an attendance policy be developed by individual faculty and included in student syllabi. (See undergraduate catalog for Undergraduate Course Attendance Policy.)]

VII. Required Textbook, Supplemental Books and Readings

Beecher, J., Penna, J., and Bittinger, M. *College Algebra*, Fourth Edition. Pearson Addison Wesley, 2011.

Cooney, M., *Celebrating Women in Mathematics,* The National Council of Teachers of Mathematics, 1996.

Green, J., *How Many Women Mathematicians Can You Name?,* Math Horizons, Vol. 9, No. 2, p. 9, 2001

VIII. Special Resource Requirements

Some instructors may require students to purchase a graphing calculator.

IX. Bibiliography

Blitzer, Robert. *College Algebra.* 5th edition, Prentice Hall, 2009

Committee on the Mathematical Sciences in the Year 2000. *Everybody Counts: A Report to the Nation on the Future of Mathematics Education.* National Academy Press, 1989.

Connally, Eric, et al. *Functions Modeling Change.* John Wiley & Sons, 2000.

Hughes-Hallet, Deborah, et al. *Applied Calculus.* John Wiley & Sons, 1999.

Lial, Margaret, et al. *College Algebra.* 10th edition, Addison Wesley, 2008

2. Summary of the proposed revisions

1. Objectives – the course objectives were revised from the original syllabus of record and aligned with the Expected Undergraduate Student Learning Outcomes (EUSLO) and Common Learning Objectives found in the criteria for a mathematics course.

2. Common Learning Objectives for a mathematics course are met in the content portion of the course (not necessarily a specific revision but it should be noted that the objectives for the new curriculum have been met). These objectives are:

    - understand deductive reasoning and apply it in the problem-solving process.
    - apply appropriate techniques to solve a variety of problems.
    - interpret, understand, and apply mathematical formulas appropriate to the course.
    - interpret, analyze, and use numerical data and graphs.
    - develop simple mathematical models to solve problems.

3. Updated the required textbook to reflect the textbook currently being used in the course.

4. Objective 5 from the old syllabus of record was removed, as it was determined to be vague and not measurable. The idea behind this objective is already covered by Objectives 1 – 4.

5. The Catalog Description was revised from the original so to be aligned with the changes made to the course objectives in accordance with the EUSLO and Common Learning Objectives.

3. Justification/Rationale for the revision

The course is a currently approved Liberal Studies Mathematics course and is being revised to meet the new curriculum criteria for this category.

4. Old syllabus of Record

MATH 105 College Algebra

3 credits
3 lecture hours
(3c-0l-3sh)

Prerequisite: MATH 100 or appropriate Placement Test score or permission of the Mathematics Department Chairperson.

Note: Students may not take MATH 105 after successfully completing a calculus course or MATH 110 without the written approval of the Mathematics Department Chairperson.

Prepares students for the study of calculus for business, natural and social sciences. Topics include detailed study of polynomial, exponential, and logarithmic functions.

II. Course Objectives

1. Students will understand and take advantage of pattern recognition in the study of mathematics.
2. Students will make a careful study of functions and their application to science, business, and economics.
3. Students will understand how to interpret functions expressed analytically and graphically.
4. Students will be able to calculate the rate of change of a function and interpret its meaning.
5. Students will leave the course with a solid set of skills and a conceptual framework to equip the students for the future study of calculus, science, and business.

III. Course Outline

A. Review of Basic Algebra (3 hours)

1. Exponents, Radicals, Rational Exponents
2. Polynomials and Factoring
3. Rational Expressions

Treat this as a review of MATH 100; do not spend a great deal of time on this!

B. Equations and Inequalities (6 hours)
   8. Equations
   9. Setting Up Equations: Applications
   10. Quadratic Equations
   11. Other Types of Equations
   12. Solving Inequalities
   13. Equations and Inequalities Involving Absolute Value

C. Graphs (5 hours)
   14. Rectangular Coordinates; Graphs of Equations
   15. Lines
   16. Parallel and Perpendicular Lines
   17. Scatter Diagrams; Linear Curve Fitting (graphing calculator users only)
   18. Variation

D. Functions and Their Graphs (8 hours)
   1. Functions
   2. Properties of Functions
   7. Library of Functions
   8. Graphing Techniques: Transformations
   9. Operations on Functions; Composite Functions
   10. Mathematical Models: Constructing Functions

E. Polynomial and Rational Functions (5 hours)
   19. Quadratic Functions and Models (non calculator users omit curve fitting)
   20. Polynomial Functions
   21. Rational Functions I (can omit oblique asymptotes if desired)
   22. Rational Functions II: Analyzing Graphs
   23. Polynomial and Rational Inequalities

F. Exponential and Logarithmic Functions (10 hours)
   24. One-to-One Functions; Inverse Functions
   25. Exponential Functions
   26. Logarithmic Functions
   27. Properties of Logarithms; Exponential and Logarithmic Models (non calculator users omit curve fitting)
   28. Logarithmic and Exponential Equations
   29. Compound Interest
   30. Growth and Decay; Newton's Law; Logistic Models

This syllabus covers 37 hours, leaving 5 hours for testing and/or review.

IV. Evaluation Methods

The final grade for the course will be determined as follows:

50% Tests. Tests will include problems on basic competency and critical thinking.
20% Final Examination. The final examination will be comprehensive and cover both basic competency and critical thinking.
30% Homework, Quizzes, and Projects. These will cover textbook assignments and applications to business and economics.
Grades will be assigned as follows:

A: 90%-100%
B: 80%-89%
C: 70%-79%
D: 60-69%
F: 0%-59%

V. Required Textbooks, Supplemental Books and Readings

Sullivan, Michael. *College Algebra*, Sixth Edition, Prentice-Hall, 2002.

VI. Special Resource Requirements

Some instructors may require students to purchase a graphing calculator.

VII. Bibliography

Committee on the Mathematical Sciences in the Year 2000. *Everybody Counts: A Report to the Nation on the Future of Mathematics Education*, Washington, DC : National Academy Press, 1989.

Connally, Eric, et al. *Functions Modeling Change*, New York: John Wiley & Sons, Inc., 2000.

Hughes-Hallet, Deborah, et al. *Applied Calculus*, New York: John Wiley & Sons, Inc., 1999.

5. Assignment instructions for one major course assignment and a grading rubric for that assignment

Major assignments for this course consist of chapter tests and final exams. Although the tests and exams cover the same content from the same chapters, instructors for each section determine their test structures and grading criteria on an individual basis

6. Answers to Liberal Studies Questions

A. This course will be taught by multiple instructors. The Service Course Curriculum Committee selects the text that all instructors will use For MATH 105 and develops the objectives for this course. Each instructor is expected to teach the same sections and have the same course objectives.

B. Whenever appropriate, instructors will introduce into the classroom discussion the contributions in mathematics by women and minorities. These discussions, for instance, can be based on content from the supplemental readings. Also, instructors will be sensitive to gender and ethnic balancing with respect to language in problem construction on homework, quizzes, and tests. The construction of contextual problems will be used to facilitate learning by making the material culturally relevant.

C. In this course we would like to exercise the exception to the use of a work of fiction or non-fiction. In this algebra course we are concentrating on developing the foundation of algebra; we will work on quantitative skills.

D. This course is an introductory course. In this course, particular attention is given to applications that arise in business, nature, finance, and health and safety professions. This course is not a part of any mathematics degree program. It does not fulfill the liberal studies requirement for mathematics majors.

Math 105
Quiz 5
April 9, 2012

Name: KEY _____ /20 points

Find all solutions to each equation.

1. $x - \frac{12}{x} = 1$. (7 points)

$\frac{x^2-12}{x} = 1 \Rightarrow x^2-12 = x \Rightarrow x^2-x-12=0$

2pts

$(x-4)(x+3)=0$

$x=4, x=-3$ 3pts

Check: 2 pts $4 - \frac{12}{4} = 4-3 = 1$ ✓

$-3 - \frac{-12}{-3} = -3+4 = 1$ ✓

2. $\sqrt{x+4} = x-2$. (7 points)

$x+4 = x^2-4x+4$

$0 = x^2-5x$ 2pts.

$0 = x(x-5)$

$x=0, x=5$ 3pts.

Check: 2pts

$x=0$: $\sqrt{0+4} = 0-2$

$4 = -2$ ✗ no

$x=5$: $\sqrt{5+4} = 5-2$

$\sqrt{9} = 3$ ✓ yes

3. $|x+3| - 2 = 8$. (6 points)

$|x+3| = 10$ 2pts

$x+3 = 10$ or $x+3 = -10$ 2pts

$x = 7$ or $x = -13$ 2pts.