COURSE OUTLINE

Course Number   Course Title        Credits
MAT120           Mathematics for Liberal Arts        3

Hours:  Co- or Pre-requisite
Lecture/Lab/Other MAT037, MAT042, SAT score over
3 Lecture  530, or an appropriate score on the
            Accuplacer Test

Implementation
sem/year  Fall 2012

Catalog description (2011-2013 Catalog):
Designed primarily for liberal arts and education majors, emphasizes mathematical systems,
reasoning, and mathematical structures. Content includes sets, symbolic logic, historical
numeration systems, number systems in other bases with their algorithms and groups.

Is the course New, Revised or Modified?  Revised

Required texts/other materials

1. Text:  Math in Our World, custom edition for MCCC
       Author:  Sobecki, Bluman and Schirck-Matthews
       Publisher: McGraw-Hill

2. Calculator: A simple calculator is permitted.

Revision date:  Course coordinator:  
Spring 2019  Alison Becker-Moses  609.570.3808  beckera@mc.cc.edu

Information resources:
• The college library has many books, CDs and Videos available.
• Access to Connect, online learning system, and ebook is available with the textbook.
• The Learning Center has tutoring and help available to the students.
MCCC Core Skills:

**Goal A. Written and Oral Communication in English.** Students will communicate effectively in speech and writing, and demonstrate proficiency in reading.

**Goal B. Critical Thinking and Problem-solving.** Students will use critical thinking and problem solving skills in analyzing information.

**Goal E. Computer Literacy.** Students will use computers to access, analyze or present information, solve problems and communicate with others.

Course-specific General Education Knowledge Goals and Core Skills:

**General Education Knowledge/Goals**

**Goal 1. Communication.** Students will communicate effectively in both speech and writing.

**Goal 2. Mathematics.** Students will use appropriate mathematical and statistical concepts and operations to interpret data and to solve problems.

**Goal 4. Technology.** Students will use computer systems or other appropriate forms of technology to achieve personal and educational goals.

**Goal 7. History.** Students will understand historical events and movements in the World, Western, non-Western or American societies and assess their subsequent significance.

In the following Course-Specific Competencies/Goals, **MCCC Core Skills** will be denoted MCS and **General Education Knowledge/Goals** will be denoted GE.

Course-Specific Competencies/Goals:

Students will demonstrate through quizzes, examinations, homework, and projects the ability to:

1. Represent and organize concepts in mathematical symbols. (MCS A, B, E; GE 1, 2, 4, 7)
2. Demonstrate comprehension of algorithms and axioms. (MCS A, B, E; GE 1, 2)
3. Analyze, represent, and solve problems in logic, set theory, and group theory. (MCS A, B, E; GE 1, 2, 7)
4. Recognize and apply the characteristics of a mathematical structure. (MCS A, B, E; GE 1, 2, 7)
5. Appreciate the development of mathematical systems throughout history. (MCS A, B, E; GE 1, 2, 7)
6. Understand the close relationship between logic and set theory. (MCS A, B; GE 1, 2)
7. Apply the rules of logic to understanding advertisements in newspapers, magazines and TV. (MCS A, B, E; GE 1, 2, 7)

In the following course-level student learning outcomes, **Course-Specific Competencies/Goals** will be denoted as CG.
Unit I: Set Theory – 12 hours

The student will be able to:
1. Recognize, explain and use the notation of sets. (CG 1, 2, 3)
2. Explain and discuss the cardinality of a set and its subsets. (CG 1, 2, 3)
3. Determine the number of subsets a set has and write all of the subsets of the given set. (CG 1, 2, 3)
4. Explain the difference between equal sets and equivalent sets. (CG 1, 2, 3)
5. Perform the set operations of complement, intersection, union and set difference when given several sets. (CG 1,3)
6. Explain the relationships among the sets of natural number, whole numbers, integers and rational numbers. (CG 1,3)
7. Visualize sets in a Venn diagram and determine the areas in the diagram that represent a given set where the set is written as a combination of set operations. (CG 1,3)
8. Analyze a survey problem by making a Venn diagram and answering questions related to the survey. (CG 1,3)
9. Prove that a given set is infinite by showing a one-to-one correspondence between the set and proper subset of itself. (CG 1,3)
10. Explain the difference between a number and a numeral. (CG 1,3)
11. Analyze the use of a numeral to determine if it is a cardinal or ordinal numeral. (CG 1,3)

Unit II: Logic – 15 hours

The student will be able to:
1. Determine if a given sentence is a simple proposition and explain why it is or why it is not. (CG 1,3)
2. Know how to negate a simple proposition and how to negate a quantified proposition. (CG 1,3, 6)
3. Translate a compound proposition into symbolic form and vice versa. (CG 1,3,4)
4. Know the rules of logic – negation, conjunction, disjunction, conditional and biconditional – and apply them to determine the truth value of a given proposition. (CG 1, 3, 6)
5. Construct a truth table to determine the conditions under which a symbolic proposition is true or false. (CG 1,2,3,4)
6. Determine the converse, inverse and contrapositive of a given implication and explain their relationships. (CG 1, 2, 3,4)
7. Know and recognize DeMorgan’s Laws in determining the truth value of a compound proposition. (CG 1, 2, 3, 7)
8. Recognize seven ways of rewriting an implication (if-then, all, implies, only if, is sufficient for, …if..., and is necessary for). (CG 1, 2, 3, 4, 7)
9. Determine if a given proposition is a tautology, contradiction, or neither. (CG 1, 2, 3, 4, 7)
10. Define an argument in mathematical terms. (CG 1, 2, 3, 4, 7)
11. Know and apply the syllogism of the contrapositive, the disjunction syllogism, the chain rule, the fallacy of the inverse and the fallacy of the converse. (CG 1, 2, 3, 4, 7)
12. Determine if an argument is valid or invalid by truth table, analysis, syllogisms, and Venn diagrams. (CG 1, 3,6,7)
Unit III: Numeration Systems – 9 hours

The student will be able to:
1. Recognize, know, and explain the difference among a simple additive, a multiplicative, and a positional numeration system. (CG 1, 4, 5, 7)
2. Interpret and write numerals in the Early Egyptian, the Roman, the Chinese-Japanese, the Babylonian, and the Mayan numeration systems. (CG 1, 4, 5, 7)
3. Recognize which kind of numeration system each of those mentioned in 2 above are and state the base of each and any modifications that apply to them. (CG 1, 4, 5, 7)
4. Understand and appreciate the numeration system used today as the Hindu-Arabic and how it is superior to other historical systems. (CG 1, 4, 5)
5. Determine the number of digits needed in other base systems using the digits in the Hindu-Arabic numeration system and A, B, C etc. for digits if the base requires more than 10 digits. (CG 1, 4, 5)
6. Convert a base 10 numeral to any other base and vice versa and interpret the numeral. (CG 1, 2, 4, 5)
7. Convert and interpret a numeral written in any base to any other base. (CG 1, 2, 4, 5)
8. Perform and explain the algorithms for addition, subtraction, multiplication, and division in any base. (CG 1, 2, 4, 5)

Unit IV: Mathematical Systems – 9 hours

The student will be able to:
1. Define a mathematical system. (CG 1, 3, 4)
2. Identify the properties of a given mathematical system – closure, associative, commutative, identity, and inverse. (CG 1, 3, 4)
3. Identify a number as rational or irrational. (CG 1, 3, 4)
4. Array the whole numbers in equivalent classes (modular systems) and understand that this is a way of taking an infinite set and writing it as a finite set. (CG 1, 3, 4)
5. Determine if two numbers are equivalent in a mod system. (CG 1, 3, 4)
**Evaluation of Student Learning:**

Students will receive regular feedback on their work through assignments, quizzes, tests, and possibly projects. Each instructor will provide the students with a syllabus which should describe dates of tests, homework assignments to be done, projects if required and due dates. The specific choices for calculation of students’ grades will be at the discretion of the instructor. There are four tests that all instructors should use. These may be given in the Academic Testing Center or in class at the choice of the instructor.

A possible plan for determining the students’ final grades is as follows:

- Unit tests (4 – one for each unit) 75%
- Homework, Projects and quizzes 25%

**Statement of Academic Integrity:**

Under no circumstance should students knowingly represent the work of another as one’s own. Students my not use any unauthorized assistance to complete assignments or exams, including but not limited to cheat-sheets, cell phones, text messaging and copying from another student. Violations should be reported to the Academic Integrity Committee and will be penalized. Please refer to the Student Handbook for more details.