



COURSE OUTLINE

MAT120
Course Number

Mathematics for Liberal Arts
Course Title

3
Credits

40 hours/2 lectures per week/15 weeks
Hours: lecture/laboratory/other (specify)

Catalog description:

This course is primarily for liberal arts and education majors, and emphasizes mathematical systems, reasoning and mathematical structures. Course content includes sets, symbolic logic, numeration systems, number systems in other bases, growth models and geometric structures.

Prerequisites: An appropriate score on the math placement exam or a grade of 'C' or better in Basic Algebra, MAT034.

Corequisites: None

Required texts/other materials: A Survey of Mathematics with Applications, 8th edition, by Angel, Abott and Runde.

Last revised: July, 2008

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Information resources:

- A Survey of Mathematics with Applications, 8th edition, by Angel, Abbott and Runde
- Videotape Series (to be available in Tutoring Center or Library)
- Digital Video Tutor (to be available in Tutoring Center or Library)
- InterActMath-Tutorial Website
- MathXL – www.mathxl.com (Online homework, tutorial, and assessment system)
- MyMathLab – www.mymathlab.com (Complete online course available with text. Site offers wide variety of resources from multimedia – video clips, animations, and the entire text is available on line at this site. Student access code required.)
- Addison-Wesley Math Tutor Center – www.aw-bc.com/tutorcenter (access card is required)

Other learning resources:

- *Student's Solutions Manual* (ISBN: 0-321-20597-9)
- *Videotape Series* (to be available in Tutoring Center or Library)
- *Digital Video Tutor* (to be available in Tutoring Center or Library)
- *InterActMath-Tutorial Website*
- *MathXL* – www.mathxl.com (Online homework, tutorial, and assessment system)
- *MyMathLab* – www.mymathlab.com (Complete online course available with text. Site offers wide variety of resources from multimedia – video clips, animations, and the entire text is available on line at this site. Student access code required.)
- *Addison-Wesley Math Tutor Center* – www.aw-bc.com/tutorcenter (access card is required)

Learning Center Resources: tutors should be available in the learning center. The instructor may wish to hold on office hour in the learning center if no tutors are available.

Course goals:

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

1. Recognize patterns, represent and organize concepts.
2. Develop theory and computational skills in areas of mathematics needed by the education major.
3. Demonstrate comprehension of algorithms and axioms.
4. Analyze, represent, and solve elementary problems in logic and set theory.
5. Recognize and apply the characteristics of a mathematical structure.
6. Analyze and apply the concepts and principles of mathematics in varying situations.
7. The student will be able to reason from what they know to form new knowledge, draw conclusions, solve problems, explain, decide, and/or predict (Inductive and/or Deductive Reasoning Skills).

Course-specific General Education Core Competencies and Goals.

- **B. Critical Thinking and Problem-Solving: Students will use critical thinking and problem solving skills in analyzing information.**
- **Ethical Decision-Making: Students will recognize, analyze and assess ethical issues and situations.**
 - C.3 Students will integrate their knowledge, take a position on an ethical issue or a situation, and defend it with logical arguments.
- **Information Literacy: Students will recognize when information is needed and have the knowledge and skills to locate, evaluate, and effectively use information for college level work.**
 - D.2 Students will identify resources needed and develop and modify appropriate search strategies to obtain the information required to answer a research question.
 - D.5 Students will respect the privacy, security, and ownership of the information they locate and use. Students will identify the ethical considerations relevant to the use of information, with particular focus on how to prevent plagiarism

- **F. Collaboration and Cooperation: Students will develop the interpersonal skills required for effective performance in group situations.**
- **Goal 1 Communication: Students will communicate effectively in both speech and writing.**
 - 1.1 Students will read, write, and listen actively, critically, and reflectively.
 - 1.2 Students will logically, informatively, persuasively, and creatively respond orally and/or in writing to what they read, hear, and see.
 - 1.3 Students will evaluate and revise their written and/or oral communication.
 - 1.4 Students will identify, critically evaluate and revise their own oral communication practices as well as evaluate the delivery techniques, use of research/sources, and speaking strategies of their peers and other communicators.
- **Goal 2 Critical Thinking and Problem-Solving: Students will use critical thinking and problem solving skills in analyzing information.**
 - 2.1 Students will develop graphical, numerical, analytical and verbal models to describe quantitative relationships that exist in the world and communicate these concepts effectively.
 - 2.2 Students will investigate and interpret these models using the mathematical skills, tools and/or reasoning appropriate to each type of model.
 - 2.3 Students will draw logical conclusions by applying a variety of mathematical problem-solving strategies.
 - 2.4 Students will demonstrate an understanding that mathematics is a precise language that is used to solve complex problems in many disciplines.
- **Goal 4: Technology or Information Literacy. Students will use computer systems or other appropriate forms of technology to achieve educational and personal goals.**
 - 4.1 Students will demonstrate proficiency with electronic communications as appropriate to academic and professional use.
 - 4.2 Students will demonstrate the ability to use a particular technology or group of technologies to analyze or solve problems
- **Goal 6: Students will analyze works in the fields of art, music, or theater; literature; philosophy and/or religious studies; and/or will gain competence in the use of a foreign language.**
 - 6.4 Students will demonstrate communicative competence in a language other than their own and an appreciation of that language's cultural and historical context (math).
- **Goal 7: Students will understand historical events and movements in World, Western, non-Western or American societies and assess their subsequent significance.**
 - 7.1 Students will demonstrate an understanding of the causes of major historical events and analyze the impact of those events on a nation or civilization.
 - 7.3 Students will explain major ideas, movements, and technological discoveries, and their impact on western, world, and American society.
- **Goal 8. Diversity and Global Perspective: Students will analyze the importance of a global perspective and culturally diverse peoples.**
 - 8.1 Students will link culture, its practices and perspectives, with its geographical and/or historical conditions.
 - 8.2 Students will analyze how the differences in people's background are important to U.S. society and the global community.

Unit I: (12 hours) Problem Solving – Set Concepts

- Introduction to logic
- Putting numbers in perspective.
- Large and small numbers and their interpretation.
- General techniques for solving problems.
- Applications to real world situations.
- Sets and Venn Diagrams and their application to logic.
- Analysis of arguments and critical thinking in real world situations.

Learning Objectives:

The student will be able to...

- Recognize and analyze Inductive and Deductive Reasoning. (CG: B, F, GE: 2, 6.4)
- Analyze and interpret graphs. (CG: B, D.2, D.5, GE: 1, 2.1, 2.2, 2.3, 4.2, 7.1, 7.3)
- Define sets and Venn diagrams. (CG: D.2, GE: 1, 2.4, 6.4)
- Solve problems using sets and Venn diagrams. (CG: B, GE: 1, 2, 6.4)
- Analyze and evaluate arguments using set theory. (CG: B, GE: 1, 2, 6.4)
- Define and verify De Morgan's Laws using Venn diagrams. (CG: D.2, GE: 1, 2)
- Apply the foregoing topics to everyday situations. (CG: B, GE: 1, 2, 4.1, 4.2,)

Unit II: (4 Hours) Growth Models and Graph Interpretation

- Graph interpretation pertaining to problem solving.
- Linear Trend: a graphical approach
- Exponential growth and decay: a graphical approach.
- Comparing and contrasting linear and exponential behavior.
- Doubling time and half-life.
- Some basic formulas and their connection to graphs of linear and exponential trends.
- Population growth in real situations.

Learning Objectives

The student will be able to...

- Define, recognize and interpret several graph types pertaining to specific problems.
(CG: B, F, D.2, GE: 1, 2, 4.2, 6.4)
- Define, recognize and interpret linear growth from graphs and tables.
(CG: B, F, D.2, GE: 1, 2, 6.4)
- Define, recognize and interpret exponential from graphs and tables.
(CG: B, F, D.2, GE: 1, 2, 6.4)
- Distinguish, compare and contrast the three types of growth from graphs and tables.
(CG: B, F GE: 1, 2)
- Use *doubling time* and *half-life* to interpret and evaluate data. (CG: B, F GE: 1, 2)
- Assess various population growth models. (CG: B, F, GE: 1, 2, 7.1, 7.3, 8.1, 8.2)
- Summarize and discuss the exponential model used to understand radioactive decay.
(CG: B, F GE: 1, 2)

Unit III : (8 Hours) Logic

- Statements and connectives
- Truth tables
- Applications of truth tables
- Syllogisms
- Validity of arguments (truth tables and syllogisms)

Learning Objectives

The student will be able to...

- Define and identify logical propositions. (CG: D.2, GE: 1, 2, 4.1)
- Construct and interpret truth tables. (CG: B, F GE: 1, 2)
- Define and verify De Morgan's Laws using Connectives. (CG: B, F, GE: 1, 2, 6.4)
- Solve problems in logic using truth tables. (CG: B, F, GE: 1, 2)
- Solve problems using Standard Forms of Symbolic Arguments. (CG: B, F, GE: 1, 2)
- Apply the foregoing topics to everyday situations. (CG: C.3, D.2, D.5, GE: 1, 2, 6.4)

Unit IV: (9 Hours) Numeration Systems Applications

- Additive, Multiplicative, and Ciphred Systems of Numeration.
- Conversions in bases other than ten.
- Computations in bases other than ten.

Learning Objectives

The student will be able to...

- Define Additive, Multiplicative, and Ciphred Systems of Numeration. (CG: D.2, D.3, GE: 1, 2, 6.4, 7.1, 7.3)
- Convert from base ten to another base system. (CG: B, F, b: 1, 2, 4.2, 6.4)
- Convert from another base system to base ten. (CG: B, F, GE: 1, 2, 4.2, 6.4)
- Demonstrate the use of Algorithms to perform Addition, Subtraction, Multiplication and Division in other base systems. (CG: B, F, GE: 1, 2, 6.4)

Unit V: (3 Hours) Geometric Models

- Plane geometry.
- Three-dimensional geometry.
- Flatland
- Units and dimensional analysis and their applications.

Learning Objectives

The student will be able to...

- Develop and use formulas for perimeter, distance, area, surface area, and volume. (CG: B, F, GE: 1, 2, 6.4)
- Define dimension and construct examples to illustrate its application to real world situations. (CG: B, F, D.2, D.3 GE: 1, 2)
- Analyze and solve everyday problems using geometric methods. (CG: B, F, D.2, GE: 1, 2, 4.2, 6.4)
- Use logic to analyze and interpret units. (CG: B, F, GE: 1, 2, 6.4)

Unit VI: (4 Hours)Voting

- Voting methods in various political systems.
- Fairness of voting

Learning Objectives

The student will be able to...

- Define Plurality, Borda Count, Plurality with Elimination, and Pairwise Comparison Methods of voting. (CG: B, F, C.3, D.2, GE: 1, 2, 4.2, 7.1, 7.3, 8.1)

- Apply the above methods of voting to determine the winner in a given election. (CG: B, F, GE: 1, 2, 9.1)
- Define Majority, Head-to-Head, Monotonicity, and Irrelevant Alternatives Criteria. (CG: B, F, C.3, D.2, GE: 1, 2, 4.2, 7.1, 7.3, 8.1)
- Apply the above criteria to determine the winner in a given election. (CG: B, F, GE: 1, 2, 6.4)

Evaluation of student learning:

The students will receive regular feedback on their work through assignments, quizzes, projects and examinations. The syllabus for this course should describe the schedule for these assessment tools and how they will be used to calculate grades. Learning activities will consist of a combination of lectures, group activities, internet research projects, and homework assignments. The coordinator has provided instructors a suggested assignment sheet. There will be four tests to be given in the Testing Center. The specific choices for calculations of students' grades will be at the discretion of the individual instructors. Outside of class, students are expected to do a significant amount of work to achieve learning goals for this course. A typical grading scheme for this course follows:

Exam I	20%
Exam II	20%
Exam III	20%
Collected Projects (2)	20%
In class quizzes	10%
Group Projects	10%

Many of the General Education Goals will be assessed during tests, projects and homework assignments. Instructors should develop tests, projects and assignments to help students develop the General Education Skills listed in the attachment to this document. Instructors should emphasize these goals in their lectures, written materials and assignments. Students will be expected to use computers for research of projects, e-mail, and homework assignments.

Academic Integrity Statement:

Under no circumstance should students knowingly represent the work of another as one's own. Students may 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 pages 53-54 of the 2005-2006 Student Handbook.