

MAT180 Mathematics for Liberal Arts (3 credit hours)

Instructor: Yasushi NARA

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Semesters: Spring

Meeting times: M,W: 12:30-13:45

Description:

The study of mathematics acquaints students with fundamental ideas and methods of logical reasoning (deduction, induction) which belong to the methodologies of all scientific disciplines. This course emphasizes the logical and conceptual aspects of mathematics that are relevant for any educated person. The material of the course includes topics in mathematics that are applicable in, and necessary for solving real life problems. At the same time they help to understand the structure of mathematics. Specifically, topics include logic and set theory which are fundamental both for critical thinking and for the skills of problem solving. For the study of random or uncertain phenomena, the elementary probability theory will be dealt with. Non-Euclidean geometries are introduced as examples that illustrate the structure and meaning of an axiomatic system, deduction and proof. Some topics such as voting systems will be discussed as examples of applications of mathematical methods. Development of students' understanding of mathematical/abstract concepts will be supported by appropriate examples and practical applications.

Objectives:

Students will acquire the knowledge of the basic concepts and methods of mathematical reasoning and axiomatic systems. They will enhance their ability to think critically and logically. On completion of this course, student should be able to understand the fundamental mathematical concepts of logic and set theory, and use the Venn diagram and truth tables for the deductive reasoning. He/She should be able to use counting methods and basic probability theory to make predictions or decisions regarding uncertain events. Students will develop skills in the applications of mathematical methods such as graph theory in their areas of study and interests.

Study Materials:

Dvid B. Johnson, Thomas A. Mowry, "Mathematics: A Practical Odyssey", 6th ed., Thomson-Brooks/Cole, 2007. ISBN 0-495-01273-4, ISBN 978-0-495-01273-3

Assessment:

The components of your grade are the following:

Homework: 20% Quizzes : 30% Final Examination: 50%

Late assignments will not be accepted.

Expected Academic Background:

There are no prerequisites for this course.

Course Format and Activities:

Class sessions have format of lectures, however questions, even when frequent, are always very welcome.

Schedule:

Week 1: 1.1 Deductive vs. Inductive Reasoning
1.2 Symbolic Logic

Week 2: 1.3 Truth Tables
1.4 More on Conditionals

Week 3: 1.5 Analyzing Arguments
2.1 Sets and Set Operations

Week 4: 2.2 Applications of Venn Diagrams
2.5 Infinite Sets

Week 5: Quiz
3.1 History of Probability
3.2 Basic Terms of Probability

Week 6: 3.3 Basic Rules of Probability
2.3 Introduction to Combinatorics
2.4 Permutations and Combinations

Week 7: 3.4 Combinatorics and Probability
3.5 Expected Value

Week 8: 3.6 Conditional Probability
3.7 Independence; Trees in Genetics

Week 9: 4.3 Measures of Dispersion
4.4 The Normal Distribution

Week 10: 4.5 Polls and Margin of Error
Quiz

Week 11: 6.1 Voting Systems
8.3 Egyptian Geometry
8.4 The Greeks

Week 12: 8.7 Non-Euclidean Geometry
8.8 Fractal Geometry

Week 13: 9.1 A Walk Through Konigsberg
9.2 Graphs and Euler Trails
9.3 Hamilton Circuits

Week 14: 9.4 Networks
9.5 Scheduling

Week 15: Final Examination.

* The schedule above is only tentative and some parts of the secondary importance material may be omitted. However, all material listed will be covered if time permits.