

Murray State University

Revised 7/28/15

DEPARTMENT: MATHEMATICS AND STATISTICS

COURSE PREFIX: MAT      COURSE NUMBER: 312      CREDIT HOURS: 3

I. **TITLE:** Mathematical Reasoning

II. **COURSE DESCRIPTION AND PREREQUISITE(S):** Course designed to improve the students' understanding of the nature and methods of mathematical proof by means of practice and participation. The content will include mathematical logic, set theory, relations and functions, cardinality, axiomatic structures, techniques of proof, and extensive practice in proof and problem solving. Credit cannot be received for both MAT 312 and 399. The department recommends a student take this course in his/her sophomore year in the program.

**Prerequisite(s):** MAT 308 or permission of instructor.

III. **COURSE OBJECTIVES:**

The student will

- A. be able to interpret the logical meaning of statements;
- B. be able to negate statements and find the contrapositives of statements;
- C. be able to combine given statements to obtain the logical conclusion of those statements;
- D. be able to construct counter-examples to false statements and examples which do satisfy given hypotheses;
- E. be able to read a "proof" and determine whether or not it is valid;
- F. recognize certain classical arguments and be able to reproduce them when necessary;
- G. be able to construct valid and clear proofs of their own;
- H. know the basic definitions surrounding the topics mentioned above; and
- I. know the theorem statements of some core theorems (these will be pointed out in class).

IV. **CONTENT OUTLINE:**

- A. Mathematical logic
- B. Techniques of proof
- C. Naïve set theory
- D. Basic number theory
- E. Relations and functions
- F. Equivalence relations

V. **INSTRUCTIONAL ACTIVITIES:**

Lecture, daily assignments, group work, projects, reading assignments, oral presentations, and quizzes the material, as per instructor course design.

**VI. FIELD, CLINICAL, AND/OR LABORATORY EXPERIENCES:**

None

**VII. TEXT(S) AND RESOURCES:**

*Mathematical Reasoning: Writing and Proof*, 2nd ed., by Ted Sundstrom.

**VIII. EVALUATION AND GRADING PROCEDURES:**

These are instructor specific, based on Exams, Homework, Quizzes, Projects, and the Final Exam. However the grading scale is standard.

Grading Scale:

90 - 100 %    A

80 - 89 %    B

70 - 79 %    C

60 - 69 %    D

Below 60%    E

**IX. ATTENDANCE POLICY:**

Students are expected to adhere to the MSU Attendance Policy outlined in the current *MSU Bulletin*.

**X. ACADEMIC HONESTY POLICY:**

Murray State University takes seriously its moral and educational obligation to maintain high standards of academic honesty and ethical behavior. Instructors are expected to evaluate students' academic achievements accurately, as well as ascertain that work submitted by students is authentic and the result of their own efforts, and consistent with established academic standards. Students are obligated to respect and abide by the basic standards of personal and professional integrity.

**Violations of Academic Honesty include:**

**Cheating** - Intentionally using or attempting to use unauthorized information such as books, notes, study aids, or other electronic, online, or digital devices in any academic exercise; as well as unauthorized communication of information by any means to or from others during any academic exercise.

**Fabrication and Falsification** - Intentional alteration or invention of any information or citation in an academic exercise. Falsification involves changing information whereas fabrication involves inventing or counterfeiting information.

**Multiple Submission** - The submission of substantial portions of the same academic work, including oral reports, for credit more than once without authorization from the instructor.

**Plagiarism** - Intentionally or knowingly representing the words, ideas, creative work, or data of someone else as one's own in any academic exercise, without due and proper acknowledgement.

Instructors should outline their expectations that may go beyond the scope of this policy at the beginning of each course and identify such expectations and restrictions in the course syllabus. When an instructor receives evidence, either directly or indirectly, of

academic dishonesty, he or she should investigate the instance. The faculty member should then take appropriate disciplinary action.

Disciplinary action may include, but is not limited to the following:

- 1) Requiring the student(s) to repeat the exercise or do additional related exercise(s).
- 2) Lowering the grade or failing the student(s) on the particular exercise(s) involved.
- 3) Lowering the grade or failing the student(s) in the course.

**If the disciplinary action results in the awarding of a grade of E in the course, the student(s) may not drop the course.**

Faculty reserve the right to invalidate any exercise or other evaluative measures if substantial evidence exists that the integrity of the exercise has been compromised. Faculty also reserve the right to document in the course syllabi further academic honesty policy elements related to the individual disciplines.

A student may appeal the decision of the faculty member with the department chair in writing within five working days. Note: If, at any point in this process, the student alleges that actions have taken place that may be in violation of the Murray State University Non-Discrimination Statement, this process must be suspended and the matter be directed to the Office of Equal Opportunity. Any appeal will be forwarded to the appropriate university committee as determined by the Provost.

## **XI. NON-DISCRIMINATION POLICY AND STUDENTS WITH DISABILITIES:**

### Policy Statement

Murray State University endorses the intent of all federal and state laws created to prohibit discrimination. Murray State University does not discriminate on the basis of race, color, national origin, gender, sexual orientation, religion, age, veteran status, or disability in employment, admissions, or the provision of services and provides, upon request, reasonable accommodation including auxiliary aids and services necessary to afford individuals with disabilities equal access to participate in all programs and activities. For more information, contact the Executive Director of Institutional Diversity, Equity and Access, 103 Wells Hall, (270) 809-3155 (voice), (270) 809-3361 (TDD).

### Students with Disabilities

Students requiring special assistance due to a disability should visit the Office of Student Disability Services immediately for assistance with accommodations. For more information, students should contact the Office of Student Disability Services, 423 Wells Hall, Murray, KY 42017. 270-809-2018 (voice) 270-809-5889 (TTD).