

MAT 415

DISCRETE MATHEMATICS

SPRING SEMESTER, 2016

(Monday/Wednesday/Friday 11:00 – 11:50)

Walters Hall 221

Course Description

DISCRETE MATHEMATICS. Combinatorics, recurrence relations, linear programming, difference equations, and graph theory. Prerequisite: MAT 251. (3 hours credit.)

Text

Grimaldi, Ralph P. Discrete and Combinatorial Mathematics; an Applied Introduction. Fifth edition. Pearson Education, Inc., 2004.

General Course Objectives

Upon completion of the course, the student will be able to:

1. Apply the Rule of Sum
2. Apply the Rule of Product
3. Compute permutations with and without repetition.
4. State and apply the Binomial Theorem.
5. Compute combinations with and without repetition.
6. Use a system of logic as an aid in problem solving.
7. Use the Principle of Inclusion and Exclusion to solve problems.
8. Solve problems involving derangements.
9. Compute Rook Polynomials and apply appropriately in problem solving.
10. Compute and apply generating functions in problem solving.
11. Solve linear recurrence relations.
12. Define graph, subgraph, complement and graph isomorphism.
13. State and apply theorems characterizing graphs with Euler trails or Euler circuits.
14. State and apply theorems characterizing graphs with Hamiltonian trails or Hamiltonian circuits.
15. Use basic graph theory in applied settings.
16. Use linear programming to solve appropriate problems.

Subject Matter or Content to be Studied

1. Combinatorics
2. Logic
3. Recurrence Relations
4. Graph Theory
5. Linear Programming

Activities and Requirements

1. Class attendance, as determined by the regulations of the university and the department.
2. Homework exercises to be completed by the student and graded at the discretion of the instructor.
3. Participation in class discussion.
4. Participation in cooperative learning through the use of manipulatives to discover combinatorial identities.
5. Scheduled tests will be given periodically throughout the semester. Students will be given adequate notice.
6. A comprehensive final examination will be given as scheduled at the end of the semester.
7. Regular and punctual attendance is necessary for successful completion of this course.

Presentation Methods

Lecture with demonstration to include the use of graphing calculators and computer software as well as cooperative learning (75%); class discussion (25%).

Evaluation and Grading

5 tests
daily grade (to include homework, pop-quizzes)

Five 100-point tests
Several 20-point quizzes will be given during the semester. Also, homework will be taken at the discretion of the instructor. The combined grade of quizzes and homework will be computed for the daily grade which will count like a major test.

Final examination grade

A 200-point comprehensive final examination.

Final Examination Date: Wednesday, May 4, 2016, at 3:00 p.m.

Grading Scale

Grades will be assigned according to the following scale:

A (90% - 100%) B (80% - 89%) C (70% - 79%) D (60% - 69%) F (below 60%)

Cheating and plagiarism are not tolerated. If it is established that a violation has occurred, the instructor may determine the penalty, or he may report the offense to the department chair and dean of the school. The usual penalty involves a grade of zero on the test, examination, or paper in question.

Make up Tests, Class Attendance, and Tardiness

A student absent from class and missing a scheduled test is entitled to a make up test if evidence is presented to the instructor that the absence was due to personal illness or death in the immediate family. Absences authorized by the Vice President for Academic Affairs for official purposes (athletics, performing groups, student government, etc.) also entitle a student to make up test privileges. Any absence from scheduled work must be covered by an excuse from the Vice President for Academic Affairs, Student Health Services, or a doctor before the student is allowed to make up that work. Any exception to this rule must be arranged before the missed work! Each student is directly responsible to the individual faculty member for making up work missed due to excused absences. ALL make up work must be completed within three days after returning to class. In order to receive credit in this course, a student must attend a minimum of 75% of the class meetings. Students in this class will be allowed no more than 11 absences, excused and unexcused. If a student exceeds the allowable number of absences, a grade of "F" will be assigned in the course. In order to be counted present, a student must arrive on time for the class and remain in class the entire time. When a student is tardy for a class, it is the student's responsibility to talk to the faculty member about changing the recorded absence to a tardy. This must be done on the day that the tardy occurred. Failure to do so will result in a recorded absence.

Classroom Policies

1. Do not use tobacco or eat in the classroom.
2. Do not bring guests, including children, to class.
3. Come to class on time.
4. Be prepared to start class at the scheduled time. Have paper, pencil, book, homework, etc., out and ready.
5. Do not ask to leave class early. Schedule any appointments at times that do not conflict with classroom time.
6. Calculator use is permitted and encouraged on all homework assignments and tests.
7. Be sure to show all work on homework assignments and tests. No partial credit can be given if no work is shown.
8. Homework will be collected and graded at the discretion of the instructor. Homework must be turned in at the time when it is requested. **No late homework will be accepted.**
9. Cheating and plagiarism are not tolerated. If it is established that a violation has occurred, the penalty will be a zero on the test, examination, or paper in question.

10. It is the responsibility of the individual student to inform the faculty member of any clinically diagnosed learning disability or other limiting disability that might in some way hinder the student's progress in this class. Reasonable accommodations are available upon request.
11. Beepers or cellular phones must be turned off and stored out of sight while in class.
12. Appropriate attire must be worn to class.

Important Dates

Students who remain in the course after January 26, 2016, and who then elect to drop the course will receive a grade of W if passing or a grade of F if failing the course at the time of the drop. A drop is not effective and complete until the drop slip has been signed by all parties designated and turned in to the Registrar's Office. No course may be dropped after April 29. The final examination for the course is scheduled for Wednesday, May 4, 2016, at 3:00 pm. That is when it must be taken. If you plan to audit this course, you must notify the instructor by January 25. You will not be allowed to change your status in this class from credit to audit after this date.

Delta State University is committed to a policy of equal employment and educational opportunity. Delta State University does not discriminate on the basis of race, color, religion, national origin, sex, age, disability, or veteran status. This policy extends to all programs and activities supported by the University.

If a student has a disability that qualifies under the American with Disabilities Act and requires accommodation, he should contact the Counseling Center (Student Health Center; phone 846-4690) for information on appropriate policies and procedures.

Instructor: Dr. Clifton Wingard

Instructor's Office: Walters Hall 213

Office Phone: 846-4510

email: cwingard@deltastate.edu

Instructor's Office Hours:

| Monday | Tuesday | Wednesday | Thursday | Friday |
|-------------------------|---------------------------|-------------------------|---------------------------|---------------|
| 9:00-10:00 1:30-4:30 | 9:30 – 11:30 3:00-4:30 | 9:00-10:00 1:30-4:30 | 9:30 – 11:30 3:00-4:30 | 9:00-10:00 |

Admission Policy for Programs Offered through The Mathematics Department

Provisional Admission

Students entering Delta State University who declare a major offered through the Department of Mathematics are initially admitted with *provisional status*. Students who demonstrate satisfactory performance in a core of introductory mathematics courses (as defined below) are granted *full admission* to the program. The intent of this policy is to insure that all students gain basic knowledge and skills in introductory core courses that are required for the level of scholarship expected from them in their advanced studies and in their future professions.

Full Admission

Full admission is granted upon satisfactory completion of the following introductory mathematics core:

| | |
|--------------------|---|
| MAT 104/105 or 106 | College Algebra and Trigonometry or Precalculus |
| MAT 251 | Calculus I |

Satisfactory completion is defined as having completed a course with a grade of C or better. **Any grade below C must be removed by repeating the course and earning a grade of C or better.** Students should be aware that repeating courses may increase the time required for graduation.

When a student fulfills the core requirements, he or she is considered to be adequately prepared to continue with advanced mathematics courses and is granted *full admission* to the program. **A student who has not been granted full admission will not be permitted to register for any upper division mathematics course.** Upper division courses are those MAT courses numbered above 251.

At the close of each semester, each student's record will be reviewed by his or her advisor and the Chair of the Curriculum Committee. The Curriculum Committee will notify each student by letter when he or she achieves full admission status. Students may check their status at any time by contacting their advisors.

Requirements for full admission also apply to students who transfer credit from other institutions. Courses equivalent to the core courses listed above must have been completed with grades of C or better to be accepted for transfer credit. Verification of transcripts should be completed prior to the start of the first semester of enrollment. Upon enrolling for the first semester, a transfer student whose transcript has not been verified will be given provisional status. When it has been verified that the student has fulfilled the requirements, he or she will be granted full admission status. Enrollment in upper division courses will not be permitted until full admission status has been granted.

Requirements for Graduation

In addition to the graduation requirements stated in the University Bulletin, the Department requires satisfactory academic performance in major courses. Specifically, this means that **the GPA in upper-level courses within the major must be at least 2.5 overall and at least 2.5 on upper-level major courses completed at DSU. No grade below C in a required major course may be applied toward graduation. Any grade below C must be removed by repeating the course and earning a C or better grade. In addition, students will take the Praxis subject area test in mathematics and pass at a published level (see the Department for the most current information). Also, students in the BSE program must have at least a 3.0 grade point average on the completed 44 hours of General Education coursework and at least a 3.0 overall grade point average.**

Failure to maintain satisfactory academic standing

A student with full admission status who fails to maintain good academic standing will be placed on departmental academic probation. When a student whose GPA in upper level mathematics courses has fallen below 2.0, he or she will be warned that he or she is in danger of being placed on probation, and that the problem course or courses should be retaken. A student who fails to improve the GPA in upper level mathematics to 2.0 or above within two semesters of being warned will be placed on *probationary status*. A student on probation will not be permitted to advance in mathematics course work until such time that the probationary problems have been corrected. Students should be aware that being on probation may increase the time required for graduation.

Proposed Course Outline

MAT 415

| | Tentative Test Dates |
|---|----------------------|
| 2.1 Basic Connectives and Truth Tables | |
| 2.2 Logical Equivalence: The Laws of Logic | |
| (2.3) Logical Implication: Rules of Inference | Test 1 January 29 |
| (2.4) The Use of Quantifiers | Test 2 February 19 |
| 3.1 Sets and Subsets | Test 3 March 18 |
| 3.2 Set Operations and the Laws of Set Theory | Test 4 April 6 |
| 3.3 Counting and Venn Diagrams | Test 5 April 22 |
| 3.4 A First Word on Probability | |
| 1.1 The Rules of Sum and Product | |
| 1.2 Permutations | |
| 1.3 Combinations: The Binomial Theorem | |
| 1.4 Combinations with Repetition | |
| 8.1 The Principle of Inclusion and Exclusion | |
| 8.2 Generalizations of the Principle | |
| 8.3 Derangements: Nothing Is in Its Right Place | |
| 8.4 Rook Polynomials | |
| 8.5 Arrangements with Forbidden Positions | |
| 9.1 Generating Functions | |
| 9.2 Definition and Examples: Calculational Techniques | |
| 9.3 Partitions of Integers | |
| 9.4 The exponential Generating Function | |
| 10.1 The First-Order Linear Recurrence Relation | |
| 10.2 The Second-Order Linear Homogeneous Recurrence Relation with Constant Coefficients | |
| 10.4 The Method of Generating Functions | |
| 11.1 Definitions and Examples | |
| 11.2 Subgraphs, Complements, and Graph Isomorphism | |
| 11.3 Vertex Degree: Euler Trails and Circuits | |
| 11.4 Planar Graphs | |
| 11.5 Hamilton Paths and Cycles | |
| 11.6 Graph Coloring and Chromatic Polynomials | |
| 12.1 Definitions, Properties, and Examples | |
| 12.2 Rooted Trees | |

Final examination: Wednesday, May 4, 2016, at 3:00 p.m.