Math 153
Finite Mathematics

JOLIET JUNIOR COLLEGE
1901
DEPARTMENT OF MATHEMATICS

Course Description
A course designed especially for students in areas such as business, economics, social science, and nonphysical sciences. It emphasizes the concepts and applications of mathematics rather than mathematical structures. Topics include: matrix algebra, applications of matrices (including solution of systems of linear equations), linear programming and the simplex method, set theory, logic, Boolean Algebra, counting and probability, stochastic processes, game theory, Markov Chains, mathematical modeling, and the mathematics of finance.

Illinois Articulation Initiative (IAI) number: M1906

Credit and Contact Hours:
Lecture   4
Lab   0
Credit Hours   4

Prerequisites: Appropriate placement score or minimum grade "C" in MATH 131 or equivalent.

Books, Supplies, and Supplementary Materials

A. **Required Textbooks**

MyMathLab Direct Digital Access. The eText is included in MyMathLab so if you are comfortable reading the textbook on the computer, you may use the eText alone. **There is no need to purchase a physical textbook for this course; the direct digital access fee for the eText was included in your course fees. Registration instructions are posted in our iCampus/Canvas site.**

B. **Other Required Materials**

TI-83+ or TI-84+ graphing calculator

C. **Methods of Instruction:**

Lecture, Hybrid, or Online

General Education Student Learning Outcome
1. Quantitative Literacy: Students possess the ability to reason and solve quantitative problems from an array of contexts.

Course Learning Outcomes (CLOs)
1. Students construct linear models from applications.
2. Students solve systems of equations with multiple methods.
3. Students solve linear programming applications with multiple methods.
4. Students apply formulas to solve financial applications.

5. Students apply Boolean algebra.
6. Students apply various counting techniques to compute probability.
7. Students apply forecasting models using Markov chains.

Lesson Learning Outcomes (LLOs)

<u>Linear Functions and Equations</u>
1. Find the slope and equation of a given line.
2. Find equations of parallel and perpendicular lines.
3. Graph linear functions and their applications.
4. Construct linear models such as supply and demand functions.
5. Find a Least Squares Line.

<u>Matrices and Systems of Linear Equations</u>
6. Solve a system of m linear equations in n variables by getting reduced row echelon form of the corresponding matrix (by hand and on the graphing calculator).
7. Solve a system of linear equations using the Gauss-Jordan Method.
8. Add, subtract, and multiply matrices.
9. Find the inverse (if it exists) of a given matrix (by hand and on the graphing calculator).
10. Determine whether two given matrices are inverses of each other.
11. Solve systems of linear equations using the Matrix Inverse Method.
12. Use the Leontief model to solve problems involving an economy.

<u>Linear Programming</u>
13. Graph linear inequalities.
14. Set up a model for a linear programming problem.
15. Solve linear programming problems, including applications, in two variables graphically.
16. Solve linear programming problems, including applications, using the Simplex method (by hand and on the graphing calculator).
17. Solve linear programming problems in minimization using duality (by hand and on the graphing calculator).

<u>Finance</u>
18. Review geometric sequence and the sum of a geometric sequence.
19. Solve problems involving simple interest.
20. Solve problems involving compound interest.
21. Compute effective rate of interest.
22. Solve problems involving the future value of an ordinary annuity and sinking funds.
23. Solve problems involving the present value of an ordinary annuity.
24. Create an amortization schedule.

<u>Logic</u>
25. Define the compound statements "conjunction," "disjunction," and "negation" and recognize the symbols used for the compound statements.
26. Construct truth tables for compound statements.
27. Determine whether statements are equivalent using truth tables.
28. Know the laws of logic in symbolic form including DeMorgan's Laws. Prove them using a truth table.
29. Define a conditional statement and give the truth table.
30. Define the converse, contrapositive, and inverse of a conditional statement and give the truth tables.
31. Determine whether a compound proposition is a tautology.
32. Determine whether arguments are valid using a truth table.
33. Give common valid argument and invalid argument forms. Prove them using a truth table.

<u>Sets</u>
34. Define a set, subset and set notation.
35. Define the set operations and show graphically on a Venn diagram: complement of a set, intersection of two sets, and the union of two sets.
36. Complete applications involving Venn diagrams.
37. Use the rule for the number of elements in the union of two sets.

<u>Counting Techniques</u>
38. Use the multiplication principle in a real world problem.
39. Use permutations and combinations to model real-world problems.

<u>Probability</u>
40. Define an experiment, sample space for an experiment and the events of a sample space.
41. Determine the probability of the conjunction, disjunction and complement of events.
42. Determine probabilities using the basic probability principal.
43. Find the probability of a union of events and the complement of an event.
44. Determine the odds in favor of an event and the odds against an event.
45. Construct a probability model by finding the sample space and appropriate probabilities for outcomes.
46. Determine independent events.
47. Determine conditional probabilities.
48. Determine probabilities using the product rule for the intersection of events.
49. Use Bayes' Theorem to determine conditional probabilities in applied problems.
50. Determine probabilities using combinations and permutations.

<u>Markov Chains</u>
51. Define a transition matrix and the basic properties of a Markov Chain.
52. Define a probability vector and determine the probability distribution vector after n repetitions of an experiment in a Markov Chain (by hand and on the graphing calculator).
53. Apply Markov models to real-world problems.
54. Define a regular Markov Chain.
55. Find the long-term behavior/equilibrium vector of regular Markov Chain (by hand and on the graphing calculator).
56. Define an Absorbing State and an Absorbing Markov Chain.
57. Analyze probabilities in a real-world problem using the Fundamental Matrix of an Absorbing Markov Chain (by hand and on the graphing calculator).

Final Course Grading Scale
Grade	Percentage
A	90-100%
B	80-89%
C	70-79%
D	60-69%
F	lower than 60%

Faculty Commitment

Faculty members are committed to providing a quality learning experience through thoughtful planning, implementation, and assessment of course activities. They are also committed to being readily available to students throughout the semester by returning e-mails and phone calls within 48 hours and to returning graded course work within a week. Furthermore, they are committed to selecting appropriate course materials and making them available in an organized and timely manner.

Student Commitment

For every credit hour a student is enrolled in, they should expect to spend at least 2 hours outside of class studying, working on assignments, and preparing for class each week of the fifteen-week semester. For example, for this four credit-hour class, students can expect to spend four hours per week in class actively engaged in learning the material by participating in face-to-face classes or viewing lectures and instructional material online. In addition, students should expect to spend another eight hours per week outside of class completing homework and assignments, posting to discussion boards online, or studying for quizzes and tests. This means students should spend a minimum of 12 hours per week engaged in achieving the learning outcomes for this course. If you are not achieving your desired results in this class, you should consider increasing your prep time outside of class, in addition to using available resources such as instructor office hours and tutoring services.

By registering for this course, you commit yourself to active participation in course activities as well as the submission of all assignments and exams on time. Furthermore, you commit to accessing the course site and checking your JJC e-mail several times a week.