Instructor's Name:

Office Location:

Office Hours:

Office Phone:

E-mail:

**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:** M1 906

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

**Prerequisites:** Satisfactory placement test score or "C" or better in MATH 131 or equivalent.

**Books, Supplies, and Supplementary Materials**

**A. Textbooks**
- or *My Math Lab Stand Alone Student Access Kit*, Pearson Ed, ISBN: 9780321199911 (optional)

**B. Other Required Materials**
- TI-83+ or TI-84+ graphing calculator

**Methods of Instruction:**
- Lecture
- Online

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Math 153 Course Syllabus

Mathematics Department
Student Learning Outcomes: General Education Student Learning Outcomes:
Students will demonstrate the ability to accurately apply correct mathematical methods and techniques in various applications such as applied sciences, theoretical mathematics, physics, natural sciences and other applied sciences.

Objectives

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

Linear Functions and Equations
- Find the slope and equation of a given line.
- Find equations of parallel and perpendicular lines.
- Graph linear functions and their applications.
- Construct linear models such as supply and demand functions.
- Find a Least Squares Line.

Matrices and Systems of Linear Equations
- 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).
- Solve a system of linear equations using the Gauss-Jordan Method.
- Add, subtract, and multiply matrices.
- Find the inverse (if it exists) of a given matrix (by hand and on the graphing calculator).
- Determine whether two given matrices are inverses of each other.
- Solve systems of linear equations using the Matrix Inverse Method.
- Use the Leontief model to solve problems involving an economy.

Linear Programming
- Graph linear inequalities.
- Set up a model for a linear programming problem.
- Solve linear programming problems, including applications, in two variables graphically.
- Solve linear programming problems, including applications, using the Simplex method (by hand and on the graphing calculator).
- Solve linear programming problems in minimization using duality (by hand and on the graphing calculator).
- (Optional) Solve linear programming problems with mixed constraints.

Finance
- Review geometric sequence and the sum of a geometric sequence.
- Solve problems involving simple interest.
- Solve problems involving compound interest.
- Compute effective rate of interest.
- Solve problems involving the future value of an ordinary annuity and sinking funds.
- Solve problems involving the present value of an ordinary annuity.
- Create an amortization schedule.

Logic
- Define the compound statements “conjunction,” “disjunction,” and “negation” and recognize the symbols used for the compound statements.
- Construct truth tables for compound statements.
- Determine whether statements are equivalent using truth tables.
- Know the laws of logic in symbolic form including DeMorgan’s Laws. Prove them using a truth table.

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• Define a conditional statement and give the truth table.
• Define the converse, contrapositive, and inverse of a conditional statement and give the truth tables.
• Determine whether a compound proposition is a tautology.
• Determine whether arguments are valid using a truth table.
• Give common valid argument and invalid argument forms. Prove them using a truth table.
• (Optional) Analyze arguments with quantifiers.

Sets
• Define a set, subset and set notation.
• 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.
• Complete applications involving Venn diagrams.
• Use the rule for the number of elements in the union of two sets.

Counting Techniques
• Use the multiplication principle in a real world problem.
• Use permutations and combinations to model real-world problems.

Probability
• Define an experiment, sample space for an experiment and the events of a sample space.
• Determine the probability of the conjunction, disjunction and complement of events.
• Determine probabilities using the basic probability principal.
• Find the probability of a union of events and the complement of an event.
• Determine the odds in favor of an event and the odds against an event.
• Construct a probability model by finding the sample space and appropriate probabilities for outcomes.
• Determine independent events.
• Determine conditional probabilities.
• Determine probabilities using the product rule for the intersection of events.
• Use Bayes’ Theorem to determine conditional probabilities in applied problems.
• Determine probabilities using combinations and permutations.
• (Optional) Determine probabilities using binomial models.
• (Optional) Find the expected value of a random variable and use it in real-world problems.

Markov Chains
• Define a transition matrix and the basic properties of a Markov Chain.
• 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).
• Apply Markov models to real-world problems.
• Define a regular Markov Chain.
• Find the long-term behavior/equilibrium vector of regular Markov Chain (by hand and on the graphing calculator).
• Define an Absorbing State and an Absorbing Markov Chain.
• Analyze probabilities in a real-world problem using the Fundamental Matrix of an Absorbing Markov Chain (by hand and on the graphing calculator).

Game Theory (Optional)
• Write a payoff matrix for a two-person game.
• Define a strictly determined game and give the optimum strategies and value of the game.
• Define a non-strictly determined game and give the optimum strategies and the expected payoffs in a mixed-strategy game.
• Apply Game Theory to real-world problems.

### TOPICAL OUTLINE

<table>
<thead>
<tr>
<th>Approximate Weeks</th>
<th>Topic or Class Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Linear Functions and Equations</td>
</tr>
<tr>
<td>2</td>
<td>Matrices and Systems of Linear Equations</td>
</tr>
<tr>
<td>1</td>
<td>Linear Programming – Graphically</td>
</tr>
<tr>
<td>1</td>
<td>Linear Programming – Simplex Method</td>
</tr>
<tr>
<td>1 1/2</td>
<td>Finance</td>
</tr>
<tr>
<td>2</td>
<td>Logic</td>
</tr>
<tr>
<td>1 1/2</td>
<td>Sets</td>
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<td>Counting Techniques</td>
</tr>
<tr>
<td>1 1/2</td>
<td>Probability</td>
</tr>
<tr>
<td>1 1/2</td>
<td>Markov Chains</td>
</tr>
</tbody>
</table>

### Graded Assignments and Policies

#### Graded Assignments

<table>
<thead>
<tr>
<th>Graded Assignment</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>In class Quizzes</td>
<td>0 – 20%</td>
</tr>
<tr>
<td>Participation</td>
<td>0 - 5 %</td>
</tr>
<tr>
<td>Projects</td>
<td>0 – 20%</td>
</tr>
<tr>
<td>Homework</td>
<td>0 – 30%</td>
</tr>
<tr>
<td>Tests</td>
<td>50 - 85%</td>
</tr>
<tr>
<td>Final</td>
<td>15 – 30%</td>
</tr>
</tbody>
</table>

#### Grading Policy

The individual instructor will determine which items he or she considers essential for the student to memorize without error and test accordingly.

Each instructor will set minimum standards for performance on tests.

#### Major Tests and Quizzes

The individual instructor will determine which items he or she considers essential for the student to memorize without error and test accordingly. Each instructor will set minimum standards for performance on tests. A comprehensive final examination will be given.

### Classroom Policies and Procedures

#### General Information

#### Attendance Policy

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Make-up Policy

Extra-credit Policy

Final Exam Information
A comprehensive final examination will be given.

Academic Honor Code
The objective of the academic honor code is to sustain a learning-centered environment in which all students are expected to demonstrate integrity, honor, and responsibility, and recognize the importance of being accountable for one's academic behavior.

College Statement about grades of “F” and Withdrawal from Class
Students may withdraw from a course by processing an add/drop form during regular office hours through the Registration and Records Office at Main Campus or Romeoville Campus, or by phone at 815-744-2200. Please note the withdrawal dates listed on your bill or student schedule. Every course has its own withdrawal date. Failure to withdraw properly may result in a failing grade of “F” in the course.

At any time prior to the deadline dates established, an instructor may withdraw a student from class because of poor attendance, poor academic performance or inappropriate academic behavior, such as, but not limited to, cheating or plagiarism.

Intellectual Property
Students own and hold the copyright to the original work they produce in class. It is a widely accepted practice to use student work as part of the college’s internal self-evaluation, assessment procedures, or other efforts to improve teaching and learning and in promoting programs and recruiting new students. If you do not wish your work to be used in this manner, please inform the instructor.

Student Code of Conduct
Each student is responsible for reading and adhering to the Student Code of Conduct as stated in the college catalog.

Sexual Harassment Joliet Junior College seeks to foster a community environment in which all members respect and trust each other. In a community in which persons respect and trust each other, there is no place for sexual harassment. JJC has a strong policy prohibiting the sexual harassment of one member of the college community by another. See the Catalog or Student Handbook.

Student Support http://jjc.edu/services-for-students/pages/default.aspx
a. Disability Services: http://www.jjc.edu/disability-services/Pages/default.aspx, Student Accommodations and Resources (StAR): If you need disability-related accommodations, specialized tutoring, or assistive technology in this class, if you have emergency medical information you wish to share with me, or if you need special arrangements in case the building must be evacuated, please inform me immediately. Please see me privately after class. New students should request accommodations and support by scheduling an appointment with the Student Accommodations and Resources (StAR) Office, Campus Center 1125, (815) 280-2230.
b. Tutoring: http://jjc.edu/tlc/Pages/default.aspx
c. Counseling and Advising: http://www.jjc.edu/counselingadvising/Pages/default.aspx
d. Academic Resources: http://www.jjc.edu/academic-resources/Pages/default.aspx
e. Support Programs and Services: http://www.jjc.edu/support-programs-services/Pages/default.aspx
f. Technology Support: http://jjc.edu/services-for-students/Pages/technology-support.aspx
g. My Degree Progress: My Degree Progress is a computerized system to track a student’s progress toward graduation. The report indicates every course and places these courses into their appropriate category as a General Education, Major Course, or Elective, according to the degree requirements. This tool is useful for preparing before an advising appointment, for planning, for registering, and for checking that the student is on track for graduation. https://eresources.jjc.edu
* Instructor reserves the right to modify, add to or change the syllabus. Any changes to the syllabus or schedule will be announced in class.

Prepared by: 
Prof. Donna Katula 
Mathematics Department

Reviewed by: 
Prof. Jean McArthur 
Department Chair

Revised 04/11
Revised 02/09
Revised 11/02
Revised 9/99
Revised 11/98
Revised 11/97
Revised 08/96