MATH 374: Stochastic/Discrete Bio Models
Fall 2025 Course Syllabus

NJIT Academic Integrity Code: Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found at: NJIT Academic Integrity Code.

Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. Any student found in violation of the code by cheating, plagiarizing or using any online software inappropriately will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university. If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at dos@njit.edu

COURSE INFORMATION

Course Description: This course provides an introduction to stochastic and discrete models in biology with a focus on applications in structured populations, molecular evolution, phylogenetics, genetics, and infectious disease modeling. No prior background in biology is needed; the emphasis of this course is on the underlying mathematical models and theory, quantitative problem solving, and computer explorations.

Number of Credits: 3

Prerequisites: MATH 244 or MATH 333 with a grade of C or better.

Course-Section and Instructors:

Course-Section	Instructor
Math 374-001	Professor J. MacLaurin

Office Hours for All Math Instructors: Fall 2025 Office Hours and Emails

Required Textbook:

Title	*Mathematical Models in Biology. An Introduction*
Author	Elizabeth S. Allman and John A. Rhodes
Edition	First
Publisher	Cambridge

ISBN #	**9780521525862**

University-wide Withdrawal Date: The last day to withdraw with a **W** is November 10, 2025. It will be strictly enforced.

POLICIES

DMS Course Policies: All DMS students must familiarize themselves with, and adhere to, the Department of Mathematical Sciences Course Policies, in addition to official university-wide policies. DMS takes these policies very seriously and enforces them strictly.

Grading Policy: The final grade in this course will be determined as follows:

Homework	30%
Quizzes and Attendance	10%
First Midterm	20%
Second Midterm	20%
Final Project	20%

Your final letter grade will be based on the following tentative curve.

A	90 - 100	**C**	65 - 74
B+	85 - 89	**D**	55 - 64
B	80 - 84	**F**	0 - 54
C+	75 - 79		

Attendance Policy: Attendance at all classes will be recorded and is **mandatory**. Please make sure you read and fully understand the Math Department's Attendance Policy. This policy will be strictly enforced.

Religious Observance: NJIT is committed to supporting students observing religious holidays. Students must notify their instructors in writing of any conflicts between course requirements and religious observances, ideally by the end of the second week of classes and no later than two weeks before the anticipated absence.

Homework/Project/Quiz Policy: There will be regular homework assignments from the text and computing assignments using MATLAB. Students are advised to do as many homework problems in the textbook as possible. It is advisable that students familiarize themselves with MATLAB as early as possible. **Exams**: There will be two midterms held during class. At the scheduled time of the final examination, students will present their projects.

Likely date of First Midterm Exam	24 October

Likely date of Second Midterm	26 November

Make sure you read and fully understand the Math Department's Examination Policy. This policy will be strictly enforced.

Makeup Exam Policy: There will be **NO MAKE-UP QUIZZES OR EXAMS** during the semester. In the event an exam is not taken under rare circumstances where the student has a legitimate reason for missing the exam, the student should contact the Dean of Students office and present written verifiable proof of the reason for missing the exam, e.g., a doctor's note, police report, court notice, etc. clearly stating the date AND time of the mitigating problem. The student must also notify the Math Department Office/Instructor that the exam will be missed. If one midterm is missed, the other midterm will count for double.

Cellular Phones: All cellular phones and other electronic devices must be switched off during all class times.

ADDITIONAL RESOURCES

Math Tutoring Center: Located in the Central King Building, Lower Level, Rm. G11 (See: Fall 2025 Hours)

Further Assistance: For further questions, students should contact their instructor. All instructors have regular office hours during the week. These office hours are listed on the Math Department's webpage for Instructor Office Hours and Emails.

Accommodation of Disabilities: The Office of Accessibility Resources and Services (OARS) offers long term and temporary accommodations for undergraduate, graduate and visiting students at NJIT.

If you need an accommodation due to a disability, please contact the Office of Accessibility Resources and Services at oars@njit.edu, or visit Kupfrian Hall 201 to discuss your specific needs. A Letter of Accommodation Eligibility from the office authorizing student accommodations is required.

For further information regarding self identification, the submission of medical documentation and additional support services provided please visit the Office of Accessibility Resources and Services (OARS) website at:

https://www.njit.edu/accessibility/

Extra References. There are many good introductory textbooks on Matlab. For instance `Matlab for Engineers' by Holly Moore. See also the introductory Matlab Onramp courses on the Mathworks website, and even the Matlab Help files are very extensive. For extra information on mathematical biology, try `Introduction to Mathematical Biology' by Jim Murray. For extra information on Stochastic Processes and Probability Theory, try `An Introduction to Stochastic Processes, with applications in Biology. 2nd Edition' by Linda Allen.

Important Dates (See: Fall 2025 Academic Calendar, Registrar)

Date	Day	Event
September 1, 2025	Monday	Labor Day
September 2, 2025	Tuesday	First Day of Classes
September 8, 2025	Monday	Last Day to Add/Drop Classes
November 10, 2025	Monday	Last Day to Withdraw

November 25, 2025	Tuesday	Thursday Classes Meet
November 26, 2025	Wednesday	Friday Classes Meet
November 27 to November 30, 2025	Thursday to Sunday	Thanksgiving Recess - Closed
December 11, 2025	Thursday	Last Day of Classes
December 12, 2025	Friday	Reading Day 1
December 13, 2025	Saturday	Saturday Classes Meet
December 14 to December 20, 2025	Sunday to Saturday	Final Exam Period

Course Outline

Week	Topic
1	*Linear Algebra Review (Chapter 2).*
2	*Linear Algebra (Chapter 2) and Predator Prey Models (Chapter 3).*
3	*Introduction to Probability and Modelling Molecular Evolution (Chapter 4).*
4	*Constructing Phylogenetic Trees (Chapter 5).*
5	*Review and First Midterm*
6-7	*Genetics (Chapter 6).*
8-9	*Infectious Disease Modeling and Advanced Stochastic Processes (Handout)*
10	*Fitting Curves to Data*
11	*Review and Second Midterm*
12 - 14	*Work on Projects*