

Course Title:	Infectious Diseases and Modeling
Course Code:	BSTA- 402
Semester:	VII
Credit Hours:	03

Learning Outcomes

By the end of this course, students will be able to:

1. recognize the basics of infectious disease modeling.
2. distinguish between theoretical analysis of mathematical disease models and control strategies.
3. comprehend the interface mathematical modeling, infectious disease data retrieval and analysis.
4. understand the infectious disease model for better detection, prevention and control of disease.

Course Outline

Unit – I

1.1 Preliminaries

Overview of the important concepts in mathematical modeling of infectious diseases.

1.2 Models

Five classic epidemic models and their Analysis.

Unit – II

2.1 Theories of mathematical background

Basic mathematical tools and techniques.

2.2 More formal models

Hybrid and switched systems, the switched SIR models, epidemic models with switching, switching control strategies, pulse control strategies, parameter estimation and non-linear least-square methods.

- **Teaching-learning Strategies:**

Class Lecture method, which includes seminars, discussions, assignments and projects. (Audio-visual tools are used where necessary)

- **Assignments-Types and Number with calendar:**

According to the choice of respective teacher.

- **Assessment and Examinations:**

According to the University's Semester Rules.

Sr. No.	Elements	Weightage	Details
1.	Midterm Assessment	35%	It takes place at the mid-point of the semester.
2.	Formative Assessment	25%	It is continuous assessment. It includes: Classroom participation, attendance, assignments, and presentations, homework, attitude and behavior, hands-on-activities, short tests, quizzes etc.
3.	Final Assessment	40%	It takes place at the end of the semester. It is mostly in the form of a test, but owing to the nature of the course the teacher may assess their students based on term paper, research proposal development, field work and report writing etc.

Textbooks:

1. Brauer, F., Castillo-Chavez, C., & Feng, Z. (2019). *Mathematical models in epidemiology*. Springer.
2. Britton, T., Pardoux, E., Ball, F., Laredo, C., Sirl, D., & Tran, V. C. (2019). *Stochastic epidemic models with inference*. Springer.

Suggested Readings:

- 1- Chen, X. (Ed.). (2020). *Statistical methods for global health and epidemiology: Principles, methods and applications*. Springer Nature.
- 2- Held, L., Hens, N., D O'Neill, P., & Wallinga, J. (Eds.). (2019). *Handbook of infectious disease data analysis*. CRC Press.
- 3- Hernandez-Vargas, E. A. (2019). *modeling and control of infectious diseases in the host: With MATLAB and R*. Academic Press.
- 4- Li, M. Y. (2018). *An introduction to mathematical modeling of infectious diseases*. Springer.
- 5- Liu, J., & Xia, S. (2020). *Computational epidemiology: From disease transmission modeling to vaccination decision making*. Springer Nature.