

Project No. Date 2025

Doc. No.	Serial No	Rev.	Proj. dep.
EOTSS29006	29006/2025	00	AUX

EOTSS Doc. CODE :

29006

EOTSS/AUX.S/29006-AUX/2025





المكتبب المندسي لحدماته التكنولوجيا و البرمجياته

ENGINERITHIOLOGY AND SOFTWARE SERVICES BIOMATHEMATIC UNPLACTING 2 BAN TOPICS AODEL S IN BIOLOGY 1 end Softwerat POPULATION MODELS BIOFILATION PODULATION 0 0 POPULATION MODELS - Biopinnonatics Applications - Practical Applications tail Dototices ended win tife

🧈 Biomathematics **Course Code: 29006-AUX** Duration: 8 Weeks | 2 Sessions per Week (Theory + Practical)

Introduction:

Biomathematics is the interdisciplinary field where mathematics meets biology. It provides the mathematical frameworks and tools needed to model, simulate, and analyze biological systems — from the spread of diseases to the dynamics of populations and genetic sequencing.

Course Description:

This course explores how mathematical models are formulated and applied in biological contexts.

Main Branch: United building - E Shams - Front NBE , El Siouf _Alexandria Tel: 01102060500-01144470856



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Biomathematics





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Students will learn about population dynamics, epidemiology, and bioinformatics, gaining a solid understanding of how mathematics drives progress in modern biology and healthcare.

© Course Objectives:

- Understand the fundamental mathematical models used in biological sciences.
- Apply mathematical techniques to study population growth, spread of diseases, and biological data analysis.
- Develop skills in interpreting biological phenomena through mathematical lenses.

G Target Audience:

- Advanced undergraduate and graduate students in Mathematics, Biology, Biotechnology, and Health Sciences.
- Professionals and researchers interested in quantitative biological modeling.
- Anyone with a background in Differential Equations and Statistics.

🛠 Materials and Resources:

- Software: MATLAB, Python (NumPy, SciPy, BioPython libraries).
- Reading Material: Research papers, biomathematics textbooks, online biological datasets.
- **Tools**: Simulation environments and epidemiological modeling platforms.

Instruction Method:

- 1 Theory Session per week (Concepts, Models, Case Studies).
- 1 Practical Session per week (Simulations, Software Usage, Project Work).
- Assignments and exercises based on real-world biological data.
- Group projects and discussions on contemporary biological challenges.

What You Will Learn:

- How to create and analyze **population models** (growth, interaction, extinction).
- How to model **epidemics** and predict disease spread (SIR models and beyond).
- \checkmark Basics of **bioinformatics**, including sequence alignment and biological data analysis.
- Application of differential equations, probability, and statistics in biological systems.
- 💐 Detailed Course Outline:
- III Week 1:

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Introduction to Biomathematics

- Overview of mathematical biology.
- The role of modeling in modern biology.
- 🔢 Week 2:

Population Dynamics I

- Exponential and logistic growth models.
- Mathematical description of competition and predation.
- Week 3:

Population Dynamics II

- Advanced population models (age-structured, spatial models).
- Applications in ecology and conservation.

🔢 Week 4:

Introduction to Epidemiology

- Basic concepts: infection rates, recovery rates, immunity.
- Introduction to the SIR (Susceptible-Infected-Recovered) model.

Week 5:

Advanced Epidemiological Models

- SEIR models (adding exposed stage).
- Vaccination strategies and modeling disease control.
- **Week 6:**

Introduction to Bioinformatics

- Biological sequences: DNA, RNA, and proteins.
- Sequence alignment and basic database searches.
- 🔢 Week 7:

Data Analysis in Biomathematics

- Statistical methods in biology.
- Handling and interpreting biological data.

Week 8:

Final Projects and Presentations

- Develop and present a model related to population dynamics, epidemiology, or bioinformatics.
- Real-world biological problem-solving.

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

• Build mathematical models to describe biological systems.

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المكتبب المندسي لحدمانه التكنولوجيا و البرمجيانه

- Analyze and simulate biological processes like epidemics and population changes.
- Use computational tools to manage and interpret biological data.
- Integrate mathematical reasoning into biological research and applications.





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