Course Code	BIO213
Course Name	Introduction to Quantitative Biology
Credits	4
Course Offered to	UG/PG
Course Description	This course will discuss some fundamental aspects of ecological, evolutionary, genetics, and epidemic models as studied by quantitative approaches. Simple mathematical and computational tools will be taken up to carry out quantitative analysis of biological systems. In addition, students will be introduced to MATLAB. Assignments and project work will include quantitative study and data analysis for biological processes (using MATLAB).

Pre-requisites		
Pre-requisite (Mandatory)	**Pre-requisite (Desirable)**	**Pre-requiste (Other)**
Basics of calculus and linear algebra	Some familiarity with MATLAB	None

Post Conditions			
CO1	**CO2**	**CO3**	**CO4**
An ability to build model for biological systems from evolution and ecology	Some knowledge of constructing quantitative models like differential and difference equation for a given biological problem and implementing solving methods	Some profieciency in using MATLAB to solve biological problems numerically	An ability to utilize the knowledge gained from this course in more advanced topics

Weekly Lecture Plan			
Week Number	**Lecture Topic**	**COs Met**	**Assignments/Lab/Tutorial**
Week 1-2	Dynamic Modeling with Difference Equations	CO1,CO2,CO3,CO4	Quantitative exercise: Use matlab to get cobweb plots
Week 3-4	Linear Models of Structured Populations	CO1, CO2, CO3, CO4	Quantitative exercise: Use matlab to solve projection matrices and make inferences from it
Week 4-5	Nonlinear Models of Interactions	CO1, CO2, CO3,CO4	Quantitative exercise: Use matlab solve ODE
Week 6-7	Modeling Molecular Evolution	CO1, CO2, CO3,CO4	Quantitative exercise: Use matlab to solve probabilistic models of DNA evolution
Week 8-9	Constructing Phylogenetic Trees	CO1, CO2,CO3,CO4	Quantitative exercise: Use matlab to construct phylogentic tress
Week 10-11	Genetics	CO1, CO2, CO4,	None
Week 12-13	Infectious Disease Modeling	CO1,CO2,CO3,CO4	Quantitative exercise: Use matlab to solve simple epidemic models

Assessment Plan	
Type of Evaluation	**% Contribution in Grade**
Quiz exams	40
Midsem	20
HW assignments	15
Endsem	25

Resource Material	
Type	**Title**
Textbook	Mathematical model in biology: an Introduction by ELIZABETH S. ALLMAN and JOHN A. RHODES
Reference	Essential Cell Biologyby Bruce Alberts, Dennis Bray, Karen Hopkin, Alexander D Johnson, Alexander Johnson, Julian Lewis, Martin Raff, Keith Roberts, Peter Walter(Garland Science)