BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, Pilani
Pilani Campus
AUGS/ AGSR Division

SECOND SEMESTER 2020-21
COURSE HANDOUT

Date: 18.01.2021

In addition to part I (General Handout for all courses appended to the Time table) this portion gives further specific details regarding the course.

Course No : MATH F420
Course Title : Mathematical Modelling
Instructor-in-Charge : BALRAM DUBEY
Instructor(s) :
Tutorial/Practical Instructors:

1. Course Description: Mathematical Modeling in Biology, Epidemiology, Model for Various Problems and Situation Using ODE and PDE, Classic Models in Ecology and Evolutionary Biology, Equilibria and Stability Analysis, Dynamics of Class-Structured Populations, Techniques for Analyzing Models.

2. Scope and Objective of the Course: The principal objective of this course is to familiarize students with the theory of population and a basic understanding of mathematical modelling of a real-world problem. Students will gain enough background to read theoretical population and evolutionary ecology literature, do simple modelling, and springboard to more complex theory if desired. Students will develop techniques for understanding and analysing simple, multivariate, and nonlinear models will be explored.

3. Text Books: Mathematical Modeling with Case studies; B Barnes & G R Fulford, CRC Press, 2008.

4. Reference Books:

R1. Essential Mathematical Biology; Britton, Nicholas F, Springer, 2004.
R2. Mathematical Modeling: a tool for problem solving in engineering, physical, biological, and social sciences by D. N. P. Murthy, N. W. Page, Ervin Y. Rodin, Butterworth-heinemann Ltd, 1990.
R3. Mathematical Biology I. An Introduction; James D. Murray, Springer-Verlag, 3rd Edition, 2005.

5. Course Plan:

Module No.	Lecture Session	Reference from the Text Book	Learning outcomes
1.	L1.1-1.2:Mathematical Models and Modeling approaches	1.1-1.3	Introduction to Mathematical Models
2.	L2.1-2.3:Models related to Exponential decay, Lake Pollution, drug assimilation,	2.3, 2.5, 2.7	Understanding some physical system models
3.	L3.1-3.5:Exponential, Logistic, Density Dependent Growth, Limited Growth with Harvesting	3.1-3.3	Understanding the population growth models
4.	L4.1-4.4: Linearization and Critical Points	7.1-7.4	Understanding the concept of stability theory

5.	L5.1-5.6: Epidemic model for influenza, predator prey model and their phase plane analysis	5.2, 5.3, 6.1, 6.2, 6.4, R1: 2.3	Understanding the concept of models in ecology and epidemiology, their analysis, and drawing information
6.	L6.1-6.6: Population models of interaction species	R1: 2.4-2.6	Understanding the concept of modelling in biological species and their dynamical behavior.
7.	L7.1-7.8: SIS, SIR models, vector borne diseases, HIV infection model	R1:3.1- 3.5, 3.7, 6.5	Classical models in Epidemiology
8.	L8.1-8.6: Solving Models using MATLAB	----	Understanding the concept of computer simulation

6. Evaluation Scheme:

Component	**Duration**	**Weightage (%)**	**Date & Time**	**Nature of component (Close Book/ Open Book)**
Mid-Semester Test	90 min.	35%	<TEST_1>	CB
Comprehensive Examination	3 h	45%	<TEST_C>	CB/OB
Quiz/seminar/assignment		20%	Announced/unannounced	CB/OB

7. Chamber Consultation Hour: Will be announced in the class.

8. Notices: All notices will be displayed on the notice board of Maths Dept / Nalanda.

9. Make-up Policy: (i) No makeup will be given in Quiz/seminar/assignment.

(ii) In midsem and comprehensive exam, make up will be given ONLY if the case is very genuine.

10. Note (if any):

Instructor-in-charge
Course No. MATH F420