INTRODUCTION TO MATHEMATICAL MODELLING

Course No: **MM24003OE**   Total Credits: **02**
Semester: **M.A/M.Sc 3rd Semester**   Total Marks: **50**
Continuous Assessment: **Marks 10**, **Theory Marks: 40**   Time Duration: **1½ Hrs**

Objectives: To enable the student to formulate mathematical models of real life problems and find their solutions and present application-driven mathematics motivated by problems from within and outside mathematics.

Course Outcomes: The course will enable students to understand concept of modelling and simulation and to construct mathematical models of real world problems and solve them using mathematical techniques.

UNIT -I

Introduction to mathematical modeling, types of modeling, classification of mathematical models, formulation, solution and interpretation of a model, models in population dynamics, linear growth and decay models, non-linear growth and decay models, continuous population models for single species, delay models, logistic growth model, discrete models, age structured populations, Fibonacci's rabbits, the golden ratio, compartment models, limitations of mathematical models.

UNIT -II

Mathematical modeling through system of ordinary differential equations, compartment models through system of ODE's, modeling in economics, medicine, international trade, gravitation; planetary motion; basic theory of linear difference equations with constant coefficients, mathematical models through difference equations in population dynamics, finance and genetics, modeling through graphs.

Books Recommended:

1. J. N. Kapur, Mathematical Modelling in Biology and Medicine, New Age International Publishers (2000).
2. Neil Gerschenfeld : The nature of Mathematical modeling, Cambridge University Press, 1999.
3. A. C. Fowler : Mathematical Models in Applied Sciences, Cambridge University Press, 1997.
4. M. R. Cullen, Linear Models in Biology, John Wiley & Sons (1985).