

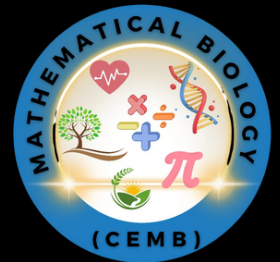


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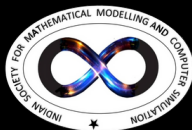
**SPEAKER**

**PROF. BALRAM DUBEY**

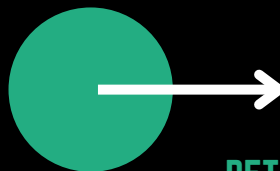
**TOPIC**

**Dynamics of Biological Species  
under Differential Environmental  
Factors using Mathematical  
Modelling**

IN COLLABORATION WITH



**INDIAN SOCIETY FOR MATHEMATICAL  
MODELING AND  
COMPUTER SIMULATION (ISMMACS)**



**DETAILS**

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**TOPIC**

# **Dynamics of Biological Species under Differential Environmental Factors using Mathematical Modelling**

**ABSTRACT**

Prey-predator relationship is one of the most important phenomenon in ecology and evolutionary biology. Over years it was our conception that predators affect prey population by direct killing. But it is observed in some field experimental studies that predator induces fear in prey which reduces the reproduction rate of prey. Prey refuge is another revolutionary idea which avert the over exploitation of prey biomass by predators. Considering this fact, a mathematical model to study the fear effect and prey refuge in prey-predator system with gestation time delay will be presented. The equilibrium points are obtained and their local and global asymptotic behavior are investigated. It is observed from our analysis that fear effect in the prey induces Hopf-bifurcation in the system. It is concluded that refuge of prey population under a threshold level is lucrative for both the species. Further we incorporate gestation delay of the predator population in the model. Local and global asymptotic stability for delayed model are carried out. The existence of stable limit cycle via Hopf-bifurcation with respect to delay parameter is established. Chaotic oscillations are also observed and confirmed by drawing bifurcation diagram and evaluating Maximum Lyapunov exponent for large values of delay parameter.

**SPEAKER**

**PROF. BALRAM DUBEY, BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI, INDIA**

**BIO**

Prof. Balram Dubey is a Professor of Mathematics at Birla Institute of Technology and Science (BITS), Pilani, where he has also served as the Head of the Department. He obtained his Ph.D. and M.Sc. degrees in Mathematics from the Indian Institute of Technology (IIT) Kanpur. He holds a B.Sc. (Hons.) in Mathematics from Bhagalpur University, graduating with top ranks at the university level. His research interests span mathematical biology, ecology, epidemiology, ecotoxicology, soil conservation, and applications of ODEs and PDEs in real-world problems. He has guided 8 Ph.D. scholars (5 ongoing) and published extensively, with over 99 papers in international journals. His academic career includes roles at Tezpur University and IIT Kanpur. Prof. Dubey has received prestigious honors including the JBS Medal and Fellowship of ISMMACS for his contributions to mathematical modeling, along with a CSIR Research Associateship and a Best Teaching Award from IIT Kanpur. His international academic engagements include visits to institutions in Ireland, Italy, Japan, China, and Nepal.

**Organised along with the Departments of:**

**MATHEMATICS AND COMPUTER SCIENCE (DMACS), BIOSCIENCES (DBIO), AND FOOD & NUTRITIONAL SCIENCES (DFNS), SSSIHL**