



## **System Modeling and Simulation**

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### **About the Book:**

Although a number of books and research papers have appeared in the literature, a need is felt to have a systematic study of the subject which inculcates into designing and preparation of this book, updated with engineering applications. The basic techniques of Modeling and Simulation are now being taught in undergraduate engineering courses and its applications in various engineering subjects require detailed studies. An attempt has been made to make this treatise useful to engineers as well as scientists, especially defence scientists.

Most of the chapters in the book are based on the papers published by the author in various technical journals. Various mathematical and computer models were incorporated to have an efficient understanding of the basics system development. In order to make the analysis easier to understand, basic mathematical techniques such as probability, discrete & continuous system, queuing system which will be essential for the understanding of the subject have also been discussed. Rather than these mathematical topics, other topics dealing with aircraft and warheads, in which various components such as survivability analysis, vulnerability and cost effectiveness are included. System dynamics and inventory control model give the basic perspective of growth and delivery rate system.

### **About the Author:**

**Dr. V.P. Singh** is at present HOD, Department of Computer Science and Engineering at Institute of Engg.

& Tech., Bhaddal, Punjab. After getting M.Sc. (Mathematics) in 1965 from Delhi University, he joined Science Laboratory (now Defence Science Center), Delhi and completed Ph.D. in Fluid Mechanics from Delhi University in 1971. He joined Terminal Ballistics Research Laboratory, Chandigarh in June 1969 and worked on various projects such as Underwater explosions, Detonation waves, Shock waves in metals, High pressure physics.

He joined Center for Aeronautical System Studies & Analysis (CASSA), Bangalore in 1985 as head of `Modeling and Simulation group` and `LCA vulnerability model` which was later used for the study of vulnerability study of various fighter aircraft. In 1989, being a core member of all the weapon development teams, developed software for *Prithvi* missiles for its effectiveness in various target damages studies. Other projects handled in CASSA are-Weapon modeling and evaluation, Vulnerability studies of aerial, sea and ground targets, Fuel Air Explosion warhead design and evaluation (shock, two phase flow), Damage to composite materials due to shock loading, Computer simulation of weapon system and allied studies.

After superannuation from CASSA in May 2000, he joined Punjab Technical University, Jalandhar as Director, Planning and Development in June 2001. Also had an additional charge of Director (Distance Education) Duties of Academics, Management & Examination Branch (Syllabi, and other problems of affiliated colleges).

After that he joined Institute of Engineering and Technology, Bhaddal (Ropar) as Professor and Head of Department of Computer Science & Engineering in October 2003, where he taught various subjects like C++, Window Programming, simulation and Modeling, CFD to B.Tech. and M.Tech Courses. He authored 50 technical papers, 20 projects and 3 books and is also the Chief Investigator of a project entitled Equation of state of metals at high pressure and temperature sponsored by DRDO, Ministry of Defence.

## Contents:

What is a System Modeling and Simulation Probability as Used in Simulation An Aircraft Survivability Analysis Discrete Simulation Continuous System Simulation Simulation Model for Aircraft Vulnerability Simulation of Queuing Systems System Dynamics Inventory Control Models Cost-Effectiveness Models

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