

## CHAPTER 28

### MATHEMATICAL SCIENCES MATHEMATICS

#### Doctoral Theses

220. BHATTA (Chet Raj)  
**Behaviour of Functions and their Fourier Transforms.**  
Supervisors : Dr. Ajay Kumar  
Th 14282

*Abstract*

Studies the behaviour of functions and their Fourier transforms on locally compact groups. Proves Cowling price theorem for threadlike nilpotent Lie group and Morgan's theorem for connected nilpotent Lie group; a uniform version of the Wiener-Tauberian theorem for separable locally compact groups; a uniform version of the Wiener-Tauberian theorem for specialized homogeneous Banach spaces which are more general than Segal algebras.

*Contents*

1. Introduction and Preliminaries. 2. Uncertainty Principle Like Hardy's Theorem for Nilpotent Lie Groups. 3. Uniform Version of the Wiener-Tauberian Theorem. 4. Uniform Version of the Wiener-Tauberian Theorem for Subspace. Bibliography.

221. MOHAMAD ALI  
**Chaos, Predictability and Controllability in Nonlinear Systems.**  
Supervisors : Dr. L M Saha  
Th 14283

*Abstract*

Deal briefly with concepts and terminologies related to a relatively new emerging branch of science Melnikov criterion is taken into consideration for investigating horseshoe chaos and non integrability of a perturbed Hamiltonian dynamical system possessing homoclinic connection. Another well known characteristics for diagnosing chaotic dynamics are the

Lyapunov exponents. A study of the local Lyapunov exponents and characteristics of fixed/periodic points embedded within a chaotic attractor of a dynamical system, is conducted. Different aspects and issues related to the problem of chaos controllability are discussed to illustrate and show some techniques which are used recently to solve the chaos controllability problem. The most common and beneficial methods for trageting and stabilizing saddle type fixed points and periodic orbits and explained. However, through the course of investigation taken in order to explore the OGY (Ott, Grebogi and Yorke) stablization technique, it was noticed that some fixed points/periodic orbits, termed as non parametric, are singular and a direct application of the OGY stablization technique, for those points, does not work. A new type of bifurcation was noticed through the course of investigation, which is termed as chaos doubling phenomena. A thorough theoretical investigation was done for better understanding of this type of bifurcation and to prove its universality and existence in other dynamical systems. It was shown that this phenomena falls into the Feigenbaum tree where the Feigenbaum number was proved to remain valid for successive chaos doubling bifurcations and this was supported by a table of numerical data.

#### *Contents*

1. Introducation to the New Revolution in Science. 2. Melnikov Theory and Characteristics of the Energy Variable. 3. Lyapunov Exponents. 4.Local Lyapunov Exponents and Characteristics of Fixed/Periodic Points Embedid within a Chaotic Attractor. 5. Chaos for Controlling Chaos Locally and Globally. 6. Non Parametric Periodic Orbit as a Singularity of the OGY Stabilization Technique. 7. Chaos Doubling Phenomena: A Bifurcation Scenario in Gumowski-Mira Map. Bibliography.

### M.Phil Dissertations

222. ARORA (Nidhi)  
**A Study of Optimization Problems Over Topological Vector Spaces.**  
 Supervisor : Dr. Surjeet Kaur Suneja
223. DAS (Pankaj Kumar)  
**On Perfect-Like Binary and Non-Binary Linear Codes.**  
 Supervisor : Prof. B K Das

224. GUPTA (Nisha)  
**A Study of Excesses of Frames**  
Supervisor : Dr. Pawan K Jain
225. GUPTA (Rashmi)  
**On Some Aspects of Zero-One Programming.**  
Supervisor : Dr. S R Arora
226. JAIN (Mukta)  
**On Spectra of Elementary Operators.**  
Supervisor : Prof. S C Arora
227. JAIN (Ranjana)  
**A Study of Frames in Banach Spaces and Localization of Frames.**  
Supervisor : Dr. Pawan K Jain
228. MATTA (Supreeti)  
**On Some Aspects of Transportation Problem.**  
Supervisor : Dr. S R Arora
229. VAID (Ruchika)  
**Higher Order Cauchy-Pompeiu Operators and their Applications.**  
Supervisor : Dr. Ajay Kumar
230. YADAV (Anju)  
**Bilevel Programming.**  
Supervisor : Dr. S R Arora