

ANNUAL REPORT (2008-09)

1. **Name and Department** **Mathematics & Statistics**

2. **New courses developed**

Name	Title	Course Number
S. Dutta	Ergodic Theory	MTH729

3. **Books and book-chapters published**

- 1) S. Mitra and Mohua Banerjee: Rough-neural methodologies in granular computing. In: *Handbook of Granular Computing*, Eds. Pedrycz, W., Skowron, A., and Kreinovich, V. (John Wiley & Sons, Chichester), 657-669 (2008).
- 2) B. V. R. Kumar, S. Belouettar, S. K. Murthy, Vivek Sangwan, Mohit Nigam, Shalini, D.A.S. Rees and P. Chandra, Soret and Dufour Effect on Double Diffusive Natural Convection in a Wavy Porous Enclosure in In: *Porous Media: Heat and Mass Transfer*, ISBN: 978-1-60692-437-2, Editors: J. L. Acosta et al., pp. - © 2008 Nova Science Publishers, Inc.
- 3) *Recent Advances In Linear Models and Related Areas*, Editors: Shalabh and C. Heumann, Publisher: Springer, 2008.
- 4) Shalabh, C.M. Paudel and N. Kumar (2008): "Simultaneous Prediction of Actual and Average Values of Response Variable in Replicated Measurement Error Models " in *Recent Advances In Linear Models and Related Areas* (Springer) (Editors: Shalabh and C. Heumann), pp. 105-133.
- 5) C. Heumann and Shalabh (2008): "Weighted Mixed Regression Estimation Under Biased Stochastic Restrictions" in *Recent Advances In Linear Models and Related Areas* (Springer) (Editors: Shalabh and C. Heumann), pp.401-416.

- 6) H. Toutenburg, Shalabh and C. Heumann (2009): "Optimal Estimation in a Linear Regression Model Using Incomplete Prior Information" in *Statistical Inference, Econometric Analysis and Matrix Algebra* (Springer) (Editors: Bernhard Schipp and Walter Kraemer), pp. 185-200.

4. Research papers published in journals

- 1) D. Bahuguna, J. Dabas, Existence and uniqueness of a solution to a semilinear partial delay differential equation with an integral condition. *Nonlinear Dyn. Syst. Theory* 8 (2008), no. 1, 7--19.
- 2) D. Bahuguna, M. Muslim, Approximation of solutions to a class of second order history-valued delay differential equations. *Nonlinear Dyn. Syst. Theory* 8 (2008), no. 3, 237--254.
- 3) D. Bahuguna, S. Abbas, J. Dabas, Partial functional differential equation with an integral condition and applications to population dynamics. *Nonlinear Anal.* 69 (2008), no. 8, 2623--2635.
- 4) M. Muslim, D. Bahuguna, Existence of solutions to neutral differential equations with deviated argument. *Electron. J. Qual. Theory Differ. Equ.* 2008, No. 27, 12.
- 5) S. Abbas, D. Bahuguna, Almost periodic solutions of neutral functional differential equations. *Comput. Math. Appl.* 55 (2008), no. 11, 2593--2601.
- 6) D. Bahuguna, D. N. Pandey, A. Ujlayan, Nonlocal semi-linear hyperbolic integro-differential equations in a Banach space. *Int. J. Appl. Math. Stat.* 13 (2008), No. S08, 21--30.
- 7) D. Bahuguna, J. Dabas, Existence and uniqueness of a solution to a partial integro-differential equation by the method of lines, *Electron. J. Qual. Theory Differ. Equ.* 2008, No. 4, 12.
- 8) R. Pal, D. Basu and Malay Banerjee, Modelling of phytoplankton allelopathy with Monod-Haldane-type functional response – a mathematical study, *Biosystems*, 95, (2009), 243 – 253.
- 9) M.A. Khan and Mohua Banerjee: Formal reasoning with rough sets in multiple-source approximation systems. *Int. J. Approximate Reasoning*, 49(2), 466-477 (2008).

- 10) M.W. Bunder, Mohua Banerjee and M.K. Chakraborty: Some rough consequence logics and their interrelations. *Transactions on Rough Sets VIII*, LNCS 5084, 1-20 (2008).
- 11) P. Muthu, B. V. Rathish Kumar, Peeyush Chandra, "A study of micropolar fluid in an annular tube with application to blood flow", *Journal of Mechanics in Medicine and Biology*, Vol 8(4), 2008,561-576.
- 12) J. B. Shukla, A. K. Misra, Peeyush Chandra, "Mathematical modeling and analysis of the depletion of dissolved oxygen in eutrophied water bodies affected by organic pollutants", *Nonlinear Analysis: Real World Applications*, Vol 9, 2008, 1851-1865.
- 13) P. K. Srivastava and Peeyush Chandra, "Hopf Bifurcation and periodic solutions in a Dynamic Model for HIV and Immune Response", *Differential Equations and Dynamical Systems*, Vol.16, 2008, 77-100.
- 14) P. Muthu, B.V. Rathish Kumar, Peeyush Chandra, "Peristaltic motion of micropolar fluid in circular cylindrical tubes: Effect of wall properties". *Applied Mathematical Modelling*, Volume 32 (10) 2008, Pages 2019-2033.
- 15) S. Chavan, A Spectral Exclusion Principle for Unbounded Subnormals, *Proceedings of the American Mathematical Society*, 137 (2009), 211 – 218.
- 16) S Chavan, On Operators Close to Isometries, *Studia Mathematica*, 186 (2008), 275 – 293.
- 17) S. Chavan, On a Friedrichs Extension related to Unbounded Subnormals-II, *Glasgow Mathematical Journal*, 50 (2008), 97 – 109.
- 18) P. Dutt, P. Biswas and G. Naga Raju, Preconditioners for spectral element methods for elliptic and parabolic problems. *J. Comput. Appl. Math.* 215 (2008), no. 1, 152--166.
- 19) M. Durea and J. Dutta, Lagrange multipliers for Pareto minimum in general Banach spaces , *Pacific Journal of Optimization*, Vol 4, pp 447-463 (2008).
- 20) M. Durea, J. Dutta and Chr. Tammer, Bounded sets of Lagrange multipliers for vector optimization problems in infinite dimension. *Journal of Mathematical Analysis and Applications*, Vol 348, 2008, pp 589-606 (2008).

- 21) D. Aussel and J. Dutta, Generalized Nash equilibrium problem, variational inequality and quasiconvexity, Vol 36, *Operations Research Letters*, pp 461-464 (2008).
- 22) J. Dutta, J. E. Martinez-Legaz and A. M. Rubinov, "Monotonic analysis over cones – III. Vol 15 *Journal of Convex Analysis*, 2008, pp
- 23) S. Dutta, V. P. Fonf, On tree characterizations of G_{\square} -embeddings and some Banach spaces. *Israel J. Math.* 167 (2008), 27--48.
- 24) S. Dutta, T. S. S. R. K. Rao, Algebraic reflexivity of some subsets of the isometry group. *Linear Algebra Appl.* 429 (2008), no. 7, 1522--1527.
- 25) S. Dutta, Alexandre Godard, Banach spaces with property (M) and their Szlenk indices. *Mediterr. J. Math.* 5 (2008), no. 2, 211--220.
- 26) M. Gupta, L. R. Acharya, Representation Theorems for Operators of type $\mathcal{S}_{\infty, \infty}^{\infty}$ and $\mathcal{S}_{\infty, \infty}^{\infty}$, *Glasnik Maematički*, 43 (63) (2008), 423 – 437.
- 27) M. Gupta, Shesadev Pradhan, On Orlicz Spaces of Entire Functions, *Indian Journal of Pure and Applied Math.*, 39 (2) (2008), 123 – 135.
- 28) M. Gupta, Shesadev Pradhan, On Certain type of Modular Sequence Spaces, *Turkish J Math*, 32 (2008), 293 – 303.
- 29) M. K. Kadalbajoo, Arjun Singh Yadaw, B-Spline collocation method for a two- parameter singularly perturbed convection-diffusion boundary value problems, *Applied Mathematics and Computation*, Volume 201, Issues 1-2, 15 July 2008, Pages 504-513.
- 30) M. K. Kadalbajoo, Arjun Singh Yadaw and Devendra Kumar, Comparative study of singularly perturbed two-point BVPs via: Fitted-mesh finite difference method, B-spline collocation method and finite element method *Applied Mathematics and Computation*, Volume 204, Issue 2, 15 October 2008, Pages 713-725.

- 31) M. K. Kadalbajoo, Puneet Arora, Space-time Galerkin least-squares method for the one-dimensional advection-diffusion equation, International Journal of Computer Mathematics, First published on 21 August 2008.
- 32) M. K. Kadalbajoo, Puneet Arora, B-spline collocation method for the singular-perturbation problem using artificial viscosity, Computers & Mathematics with Applications, Volume 57, Issue 4, Feb. 2009, Pages 650-663.
- 33) M. K. Kadalbajoo, Ritesh Kumar, Composite high resolution localized relaxation scheme based on upwinding for hyperbolic conservation laws, International Journal for Numerical Methods in Fluids.
- 34) M. K. Kadalbajoo, Ashish Awasthi, Crank-Nicolson Finite Difference Method Based On Midpoint Upwind Scheme On Non-Uniform Mesh For Time Dependent Singularly Perturbed Convection Diffusion Equations, International Journal of Computer Mathematics, Vol. 85, pp. 771-790, 2008.
- 35) M. K. Kadalbajoo, Ashish Awasthi, Uniformly Convergent Numerical Method for Solving Modified Burgers' Equations on a Non-Uniform Mesh Journal of Numerical Mathematics, Vol. 16, pp. 217-235, 2008.
- 36) M. K. Kadalbajoo, Vikash Gupta, Numerical solution of singularly perturbed convection-diffusion problem using parameter uniform B-spline collocation method, Journal of Mathematical Analysis and Applications, Volume 355, issue 1, July 2009, Pages 439-452.
- 37) M. K. Kadalbajoo, Devendra Kumar, A non-linear single step explicit scheme for non-linear two-point singularly perturbed boundary value problems via initial value technique, Applied Mathematics and Computation, Volume 202, Issue 2, 15 August 2008, Pages 738-746.
- 38) M. K. Kadalbajoo, Devendra Kumar, Fitted mesh B-spline collocation method for singularly perturbed differential-difference equations with small delay, Applied Mathematics and Computation, Volume 204, Issue 1, 1 October 2008, Pages 90-98.
- 39) M. K. Kadalbajoo, Devendra Kumar, Parameter-uniform fitted operator B-spline collocation method for self-adjoint singularly perturbed two-point boundary value problems, Electronic Transactions on Numerical Analysis, Volume 30, pp. 346-358, 2008.

- 40) M. K. Kadalbajoo, Devendra Kumar, Initial value technique for singularly perturbed two point boundary value problems using an exponentially fitted finite difference scheme *Computers and Mathematics with Applications*, Volume 57, Issue 7, April 2009, Pages 1147-1156.
- 41) B. V. R. Kumar, Shalini, S. Belouettar, S. K. Murthy, Vivek Sangwan and Mohit Nigam, A 3-D Finite Element Computation of Free Convection from a Cubical Structure Buried in a Fluid Saturated Porous Enclosure on ANU-Cluster, September 2008, Volume 2, Number 3, *Engineering Applications of Computational Fluid Mechanics*
- 42) Mani Mehra and B.V. Rathish Kumar, Error Estimates for linear PDEs solved by Wavelet based Taylor-Galerkin schemes, *International Journal of Wavelets, Multiresolution and Information Processing*, 3 Vol. 7, No. 1 (2009) 1–20
- 43) S.K. Iyer, S.R. Jammalamadaka and D. Kundu, "Analyzing middle censored data with exponential lifetime distributions", *Journal of Statistical Planning and Inference*, vol. 138, 3550 - 3560, 2008.
- 44) A. Prasad, D. Kundu and A. Mitra, "Sequential estimation of the sum of sinusoidal model parameters", *J. of Statistical Planning and Inference*, vol. 138, no. 5, 1297 - 1313, 2008.
- 45) A. Sarhan, D. Kundu, "Bayes estimators for reliability measures in geometric distribution model using masked system life test data", *Computational Statistics and Data Analysis*, vol. 52, 1821-1836, 2008.
- 46) D. Kundu, R.D. Gupta, "Generalized exponential distribution; Bayesian Estimation", *Computational Statistics and Data Analysis*, vol. 52, 1873-1883, 2008.
- 47) D. Kundu, "Bayesian inference and reliability sampling plan for Weibull distribution", *Technometrics*, vol. 50, no. 2, 144 - 154, 2008.
- 48) D. Kundu, A. Banerjee, "Inference based on Type-II hybrid censored data from Weibull distribution", *IEEE Transactions on Reliability*, vol. 57, no. 2, 369 - 378, 2008.
- 49) B. Basu, D. Tiwari, D. Kundu and R. Prasad, "Is Weibull distribution the most appropriate statistical strength distribution for brittle materials?", *Ceramics International*, vol. 35, 237 - 246, 2009.

- 50) M.Z. Raqab, M.T. Madi and D. Kundu, "Estimation of $P(Y < X)$ for 3-parameter generalized exponential distribution", *Communications in Statistics - Theory and Methods*, vol. 37, no. 18, 2854 - 2864, 2008.
- 51) C.S. Kakade, D.T. Shirke and D. Kundu, "Inference for $P(Y < X)$ in Exponentiated Gumbel Distribution", *Journal of Statistics and Applications*, vol. 3, no. 1-2, 121 - 133, 2008.
- 52) N. Balakrishnan and Q. Xie and D. Kundu, "Exact inference for a simple step-stress model from the exponential distribution under time constraint", *Annals of the Institute of Statistical Mathematics*, vol. 61, 251 - 274, 2009.
- 53) D. Kundu, R.D. Gupta, "Bivariate generalized exponential distribution", *Journal of Multivariate Analysis*, vol. 100, no. 4, 581 - 593, 2009.
- 54) A. K. Lal, S. Barik and S. Pati, On Trees with Laplacian Eigenvalue One, *Linear Multilinear Algebra*, 56(2008), no. 6, 597—610.
- 55) R. B. Bapat, A. K. Lal, S. Pati, Laplacian spectrum of weakly quasi-threshold graphs. *Graphs Combin.* 24 (2008), no. 4, 273--290.
- 56) A Gaur, A. K. Maloo, Minimal prime submodules, *International Journal of Algebra*, Vol. 2, no. 17-20, 2008, 953-956.
- 57) R. M. Mnatsakanov, Neeraj Misra, Sh. Li, E. J. Harner, kn-nearest neighbor estimators of entropy, *Math. Methods Statist.* 17 (2008), no. 3, 261—277.
- 58) Neeraj Misra, Nitin Gupta, I D Dhariyal, Preservation of some aging properties and stochastic orders by weighted distributions. *Comm. Statist. Theory Methods* 37 (2008), no. 3-5, 627—644.
- 59) Neeraj Misra, Nitin Gupta, I D Dhariyal, Stochastic properties of residual life and inactivity time at a random time. *Stoch. Models* 24 (2008), no. 1, 89—102.
- 60) S. Mitra, Studying the Impact of Policy Reforms on Industrial Development in India using Self-Organization maps, *Applied Artificial Intelligence*, Vol.22, No. 9, pp. 870-895 (2008).

- 61) D. Kundu, S. Mitra, "Analysis of the left censored data from the generalized exponential distribution", Journal of Statistical Computation and Simulation, vol. 78, no. 7, 669 - 679, 2008.
- 62) K. Andersen, P. Mohanty, Restriction and extension of Fourier multipliers between weighted L^p spaces on \mathbb{R}^n and \mathbb{T}^n . Proc. Amer. Math. Soc. 137 (2009), no. 5, 1689--1697.
- 63) S. Madan, P. Mohanty, Jodeit's extensions for bilinear multipliers, Bull. Lond. Math. Soc., 40, 2008, 937-944.
- 64) B. Datta, N. Nilakantan, Three-dimensional pseudomanifolds on eight vertices. *Int. J. Math. Math. Sci.*
- 65) S. R. Patel, Frechet algebras, formal power series, and automatic continuity, Studia Mathematica, 187 (no. 2), 2008, 125-136.
- 66) J. Tyagi, V. Raghavendra, An oscillation criteria for second-order nonlinear differential equations with functional arguments, Electron. J. Diff. Eqns., Vol. 2009(2009), No. 30, pp. 1-7.
- 67) S. K. Ray, R. P. Sarkar, Fourier and Radon transform Harmonic NA groups, Trans. Amer. math.Soc. 2009 (electronically published in 16th March 2009).
- 68) S. K. Ray, R. P. Sarkar, A Theorem of Beurling and Hormander on Damek Ricci spaces, Advances in Pure and applied Mathematics, 2009.
- 69) G. Santhanam, Hypersurfaces in Simply Connected Space forms, Proc. Indian. Acad. Sci.(Math.Sci) Vol 118, No.4, November 2008, pp.569-572.
- 70) H. Toutenberg, V. K. Srivastava and Shalabh, Amputation versus imputation of missing values through ratio method in sample surveys, Statistical Papers, Vol. 49, No. 2, 2008, pp. 237-247.
- 71) Pen-Hwang Liau and Shalabh, *Confidence Interval Estimation in Ultrastructural Model*, Communications in Statistics (Theory & Methods), 38:5, 2009, pp. 675-681.
- 72) Shalabh, C.M. Paudel and N. Kumar, *Consistent estimation of regression parameter under replicated ultrastructural model with non-normal errors*, Journal of Statistical Computation & Simulation, Vol. 79, No. 3, 2009, pp. 251-274.

- 73) P. Sinha, J. B. Shukla, Shalini Sharma and Balram Dubey, Modeling the survival of a resource-dependent population: Effects of toxicants (pollutants) emitted from external sources as well as formed by its precursors, *JOURNAL OF NONLINEAR ANALYSIS: Series B Real World Applications*, Vol. 10, pp. 54-70, 2009.
- 74) P. Sinha, Adamu Getachew, THD analysis for Slider Bearing with roughness: Special Reference to Load Generation in Parallel Sliders, *ACTA MECHANICA*, 2008, 10 October 2008.

5. Research papers published in conference proceedings (as a full paper)

- 1) Mohua Banerjee and M.A. Khan (2008): Rough set theory: a temporal logic view. In: *Studies in Logic Vol. 15, Proc. Logic, Navya-Nyāya & Applications: Homage to Bimal Krishna Matilal*, January, 2007, Kolkata, Eds. Chakraborty, M.K., Löwe, B., Mitra, M.N., Sarukkai, S. (College Publications, London), 1-20.
- 2) M.A. Khan and Mohua Banerjee (2008): Multiple-source approximation systems: membership functions and indiscernibility. In: *LNAI 5009, Proc. Rough Sets and Knowledge Technology (RSKT 2008)*, May, 2008, Chengdu, China, Eds. Wang, G., Li, T., Grzymala-Busse, J., Miao, D., Skowron, A., Yao, Y. (Springer-Verlag), 80-87.
- 3) S. Dempe, J. Dutta and B. S. Mordukhovich, Variational analysis in bilevel programming, *Mathematical Programming and Game Theory for Decision Making*, Proceedings of the International Symposium on Mathematical Programming and Game Theory for Decision Making : Indian Statistical Institute, Delhi, Dec. 10-11, 2007, World Scientific, Singapore, 257-277 (2008).
- 4) B. Bhattacharjya, A. K. Lal, On the existence of constrained labelling of locally finite graphs. Proceedings of the Thirty-Eighth Southeastern International Conference on Combinatorics, Graph Theory and Computing. Congr. Numer. 187 (2007), 132—144.
- 5) A. K. Lal, S. Pati and K. L. Patra, Graph Structure via its Laplacian matrix, *The Mathematics Student*, Vol. 76, Nos. 1-4(2007), 203-216.

- 6) H. Janwa and A. K. Lal, On Generalized Hamming Weights and the Covering Radius of Linear Codes, LNCS, 4851/2007, 347-356.
- 7) Neeraj Misra, Nitin Gupta and R. D. Gupta, Stochastic comparisons and aging properties of multivariate reversed frailty models. Proceedings of International Conference on Mathematical Sciences-2007 (ICMS-2007) Bangi-Putrajaya, Malaysia, 2007, 993-1015.
- 8) Sunita Daniel, P. Shunmugaraj, Three point Stationary and Non-Stationary Subdivision Schemes, appeared in the proceedings of Geometric Modeling and Imaging, IEEE Computer Society, pp.3-8, 2008.

6. **Seminars and invited talks presented:**

- 1) Malay Banerjee, 'Dynamical Analysis in Mathematical Ecology', IIT Kanpur, 8th Dec. 2008.
- 2) Malay Banerjee, 'Nonlinear Dynamical Modelling in Mathematical Ecology', Department of Mathematics, IIT Guwahati, 20th March, 2009.
- 3) Mohua Banerjee, Logics for Information Systems, invited talk at the Workshop on *Logic and Cognition*, Jadavpur University, Kolkata, October 23-25, 2008.
- 4) P. Chandra, "Mathematical Modeling" - Invited theme Lecture in a workshop on Advanced mathematics, Department of Mathematics, BHU, Varanasi.
- 5) S. Chavan, Hyperexpansivity version of the Berger-Shaw Theorem, delivered a presentation in the conference 'International Workshop on Operator Theory and its Applications' held at the College of William and Mary, Virginia, during July 22 - 26, 2008.
- 6) S. Dutta, On hereditary semi-embeddings and G_{\square} -embeddings of Banach spaces, presented at ISI Bangalore while visiting there under young scientist visiting program of ISI, March 5, 2009.
- 7) S Ghorai, Simple Box Model and Advection Diffusion Equations and Numerical Solutions, 5-8-2008, IIT Kanpur.

- 8) M K Kadalbajoo, Presented 04 invited lectures in the Indo- German instructional school and workshop held at IIT Madras during January 6-18,2009,on "FEM-A Birds Eye view" and "FEM for Unsteady Problems".
- 9) B.V. Rathish Kumar, A Look at Cardiac-Electric-Activity & Domain Decomposition Methods, ICCPDE-08, Dec 10-13, 2008 at IIT Mumbai.
- 10) B.V. Rathish Kumar, A Look at the Arlequin Approach for Multiscale / Multimodel Problems (53rd Congress of ISTAM (An International Meet) University College of Engineering, Osmania University, Hyderabad, December 27-30, 2008.
- 11) B. V. Rathish Kumar, Mathematics at the frontiers of Science & Technology, Jan 30-31, 2009, DBS College Kanpur.
- 12) B. V. Rathish Kumar, Glimpses of Mathematical Modeling and Simulations pertaining to Cardio-Vascular Flows under Pathological conditions, ICRTMA-09, March 30-31, 2009.
- 13) D. Kundu, "Bivariate Generalized Exponential Distribution", Presented at Indian Statistical Institute, New Delhi, Sept. 15, 2008.
- 14) D. Kundu, "Reliability Sampling Plan", Presented at Indian Statistical Institute, New Delhi, Sept. 16, 2008.
- 15) D. Kundu, "Generalized Exponential Distribution: A Review", Presented at the University of Cochi, Trivandam, Dec. 2008.
- 16) Neeraj Misra, Convex Functions and Inequalities. Christ Church College, Kanpur, January 2009.
- 17) P. Mohanty, Extensions of Multipliers, University of Hawaii, USA, May 2008.
- 18) V. Raghavendra, On Maps which are one-one iff they are onto (an invited talk), IIT Madras, March 23, 2009.

- 19) V. Raghavendra, On Elliptic equations and jumping nonlinearities (an invited talk), IIT Madras, March 24, 2009.

7. Conferences attended outside IIT Kanpur

- 1) Malay Banerjee, 'Stochastic Differential Equation Modeling of Some Ecological Systems', National Conference on Mathematical Modeling and Simulation, IITM Gwalior, 11th January, 2009.
- 2) Malay Banerjee, 'Stochastic Modeling and Simulation in Bio-mechanics', National Conference on Biomechanics, IIT Roorkee, 8th March, 2009.
- 3) Mohua Banerjee, *4th Asia-Pacific Computing and Philosophy (APCAP) Conference*, IAS, IISc Bangalore, December 5-7, 2008 – presented invited paper on Tolerance and Communication: a Rough Set Formalism.
- 4) Mohua Banerjee, Logics from Rough Sets, invited talk at the *National Seminar on Mathematics with special emphasis on Discrete Mathematics (NSMDM 2009)*, Univ. of Calcutta, February 25-26, 2009.
- 5) Mohua Banerjee, Rough Sets: Algebraic Aspects, invited talk at the *74th Annual Conference of the Indian Mathematical Society*, Univ. of Allahabad, December 27-30, 2008.
- 6) Mohua Banerjee, *Third Indian Conference on Logic and its Applications (ICLA 2009)*, January 7-11, 2009, IISc, Chennai – chaired sessions in the pre-conference workshop on Algebraic Logic, and also a session of invited talks in the main conference on January 10.
- 7) S. Chavan, Subnormal Algebraic Operator Tuples, delivered a talk in the HRI International Conference in Mathematics held at Harish-Chandra Research Institute, Allahabad, during March 16-20, 2009.
- 8) P. Chandra, Interdisciplinary Science Conference- 2008 on Mathematics in Biology, Jamia Milia Islamia, New Delhi, Dec, 4, 2008, chaired a session and delivered an Invited talk on Mathematical Biology.
- 9) P. Chandra, (76th Annual session of Indian Mathematical Society, Allahabad University, Allahabad, Dec. 26-30, 2008 delivered an Invited talk 'Ecological Modeling' in the Symposium on Mathematical Ecology.

- 10) P. Chandra, National Conference Mathematical Modeling and Computer Simulation, ABV IITM Gwalior, Jan. 10, 2009, Delivered an Invited Talk "Modeling The Dynamics of HIV in Vivo: A Mathematical Review". Also chaired a session.
- 11) P. Chandra, National Seminar on "Mathematics & Its Applications to Industries" - DBS College, Kanpur, Jan. 31- Feb. 1, 2009, Delivered Presidential address.
- 12) P. Chandra, National Seminar on 'Advanced Fluid Mechanics', NIT Warangal, June 23- 27, 2008, Delivered Key note talk on Non-Newtonian Fluid Mechanics. Also chaired a session.
- 13) M. Gupta, Great Plains Operator Theory Symposium, University of Cincinnati, Cincinnati, USA, June 17-22, 2008. Delivered a talk titled "On the Representation of Lorentz Sequence class type Operators".
- 14) M. Gupta, International workshop on Operator Theory, College of Williams and Mary, Williamsburg, Virginia, USA, July 22 – 26, 2008. Delivered a talk titled "On the Ideals of Orlicz type Operators".
- 15) M. Gupta, International conference on Analysis and its Applications, Aligarh Muslim University, Aligarh, India, Nov. 3-5, 2008. Delivered an invited talk titled "On Matrix Transformations and Multipliers".
- 16) M. Gupta, Indian Mathematical Society Annual Meeting, University of Allahabad, Dec. 2008, chaired a session.
- 17) M. K. Kadalbajoo, Participated in the international conference on Differential Equations and Dynamical Systems and presented a paper entitled " A Hybrid Finite Difference Method with Shishkin Mesh for Solving Singularly Perturbed One- dimensional Parabolic Problems during May 22-26, 2008 at Baltimore, Maryland, USA.
- 18) M. K. KadalBajoo, Presented an invited lecture entitled", High Resolution Shock Capturing Schemes for Hyperbolic Conservation Laws", at the International Conference on Numerical Methods for PDEs during December 10-13, 2009 at IIT Bombay.
- 19) P. Mohanty, Invited Speaker, Indo-French Conference in Mathematics, Dec. 2008 Madras.

- 20) V. Raghavendra, Nonlinear Elliptic equations-an over view (an invited talk), National conf. on Analysis and applications, Jan.10 to Jan.12, 2009, Department of Mathematics, Sardar Patel university, V.V. Nagar, Gujarat. Also chaired a session.
- 21) V. Raghavendra, Nonlinear Elliptic Equations (an invited talk), 24th Annual conference of the Mathematical Society of BHU, Dept. of Mathematics, BHU, Varanasi. Also chaired a session.
- 22) R. Rawat, Approximation by K finite functions, invited talk at National Conference on Fourier analysis and its Applications, Ramanujan Institute for Advanced Study in Mathematics, University of Madras, Chennai, Feb.25- 27, 2009.
- 23) R. Rawat, Twisted spherical means in annular regions in \mathbb{C}^n , invited talk at HRI International Conference in Mathematics, Harish-Chandra Research Institute, Allahabad March 16-20, 2009.
- 24) G. Santhanam, Obata's theorem and its generalizations, invited talk at HRI International Conference in Mathematics, HRI Allahabad, March 7-8 and March 16-20, 2009.
- 25) Prawal Sinha & Getachew Adamu, Thermal and roughness effects in a slider bearing with special reference to load generation in parallel sliders, presented at the 63rd ANNUAL MEETING OF THE STLE, CLEVELAND, OH, USA, May 17-22, 2008.
- 26) Prawal Sinha & Getachew Adamu, Mathematical Modeling of Thermo Hydrodynamic Effects in a Rough Slider Bearing Considering Heat Conduction through the Pad, presented at the 2008 International Conference on Modeling, Simulation and Visualization Methods (MSV'08) held at LAS VEGAS, NV, USA during July 14-17, 2008.
- 27) Prawal Sinha & Getachew Adamu, Thermal and Roughness effects in a Slider Bearing Considering Heat Conduction through both the Pad and the Slider, to be presented at the STLE/ASME International Joint Tribology Conference, to be held at Miami, Florida, USA, October 20-22, 2008.
- 28) U. B. Tewari, The Fourier Algebra of a Locally Compact Group and Completely Bounded Multipliers, IMS- 2008.

8. **Other Activities**

(a) Technology Developed

Name of the technology/product

(b) Software Developed

Name of the software

(c) Industry visited and visits to other Institutes for research

- 1) J. Dutta, Department of Mathematics, University of Limoges, France, 26th May-1st June 2008.
- 2) J. Dutta, Department of Mathematics, University of Perpignan, France , 2nd June-30th June 2008.
- 3) A. K. Lal, Dept. of Mathematics, IIT Guwahati, Dec. 17 – 23, 2008.
- 4) A. Mitra, Industry visited and visits to other Institutes for research, Department of Econometrics and Business Statistics, Monash University, Melbourne, Australia, May 18-July 12, 2008.
- 5) S. R. Patel, IISc., Bangalore, to attend a lecture series on 'Multi-normed spaces and multi-Banach algebras', Jan. 01-06, 2009.
- 6) S. R. Patel, Department of Pure Mathematics, University of Leeds, Leeds, U. K.; to avail a Commonwealth fellowship; from Jan. 26 to Jul. 26, 2009.

(d) Patents

(Title, Patent number, granting agency)

(e) Awards and Honors

- 1) Mohua Banerjee, elected Secretary, Association for Logic in India.

- 2) S. R. Patel, Commonwealth Academic Staff Fellowship; awarded by the Commonwealth Scholarship and Fellowship Commission in the United Kingdom.

(f) Continuing Education Activities

Name and type of the course organized (QIP, Self-financing, Industry),
Place, Dates, and profile of participants (university/industry)

- 1) Mohua Banerjee, Co-ordinator (with M. Gehrke), *Workshop on Algebraic Logic* (<http://ali.cmi.ac.in/icla2009/alogic.html>), January 7-8, 2009, IMSc, Chennai; 4 invited speakers, 3 contributed papers, about 35 participants – graduate students and researchers.
- 2) S. Chavan, Worked as a resource person in Advanced Training in mathematics for Lecturers (Functional Analysis-II) funded by NBHM at Bhaskaracharya Institute of Mathematics, Pune, 3-15 Dec. 2008.
- 3) P. Chandra, Advanced Training Programme (Supported by DST, New Delhi) Pondicherry University, June 16- 20, 2008 - Resource Person.
- 4) P. Chandra, Basic Training Programme in Mathematics for UG students (Supported by DST, New Delhi), BNSD College, Kanpur, Nov. 17 - 30, 2008 - Resource Person.
- 5) A. K. Lal, Basic Training Programme in Mathematics for UG students (Supported by DST, New Delhi), BNSD College, Kanpur, Nov. 17 - 30, 2008 - Resource Person.
- 6) S. Madan, A series of lectures in the Indo-French Workshop on Harmonic Analysis, Dec. 2008, Bangalore.
- 7) B. V. Rathish Kumar, Study Group Meeting on Industrial Mathematics, March 16-21, 2009, IIT Roorke.
- 8) B. V. Rathish Kumar, B N S D College Nov 17-30, 2008 (sponsored by DST) Basic Training Programme in Mathematics.
- 9) G. Santhanam, Resident Faculty at MTTTS Programme held at RIE, Mysore, May 19-June 14, 2008.

(g) Participation in High Level Industry Academia Interaction Program during summer

Name of the organization, Period

(h) Any other important activity not specified above

- 1) Mohua Banerjee, Programme Committee Member, *IFSA-EUSFLAT 2009*, July 20-24, 2009, Lisbon, Portugal.
- 2) Mohua Banerjee, Programme Committee Member, *Third Indian Conference on Logic and its Applications (ICLA 2009)*, January 7-11, 2009, IMSc, Chennai.
- 3) D. Kundu, Editorial Board Member of the Journal of Modern Applied Statistical Methods.
- 4) D. Kundu, Editorial Board Member of the journal Statistics and Its Applications.
- 5) D. Kundu, Editorial Board Member of the Journal Communications in Statistics - Theory and Methods.
- 6) D. Kundu, Editorial Board Member of the Journal Communications in Statistics - Simulation and Computation.
- 7) Amit Mitra (PI) and Debasis Kundu (Co-PI): Awarded DST SERC Project titled 'Analyzing Non-Stationary Signals' from the Department of Science & Technology, Government of India.
- 8) S. K. Ray, organized 23rd annual meeting of the Ramanujan Mathematical Society at IIT Kanpur in May 2008.