

Department of Mathematics

Annual Report (2007-08)

The year witnessed excellent contributions and achievements of faculty and students in research; interaction with industry and noted national and international institutes, universities and organizations; and extended educational activities beyond the departmental academic programmes.

Some of the notable events include : Prof. Gopal K. Srinivasan being selected to receive the Excellence in Teaching Award 2007, Prof. U. K. Anandavardhanan being selected as an Associate of the Indian Academy of Sciences, Bangalore, and Amiya K. Pani representing South Asia at the ICIAM 2007 Round Table Discussion on 'Developing Mathematics in the Developing World'. In 2007-08, six faculty members in the Department served as members of the editorial board of national and international journals.

As a part of Golden Jubilee celebrations, many distinguished visitors like *Prof. David Mumford* (Field medallist, Brown University), *Prof. S.-T. Yau* (Field medallist, Harvard University), *Prof. Richard Hamilton* (Columbia University), *Prof. Manjul Bhargava* (Princeton University), Prof. John Whiteman (FRSA, Brunel University), visited the Department.

Academic Programmes

Besides the teaching of B. Tech. courses, the Department offers M.Sc. and Ph.D. programmes. It has two distinct M.Sc. programmes: M.Sc. in Mathematics and M.Sc. in Applied Statistics and Informatics (ASI). In addition, the Department has a research programme leading to Ph.D. degree. This year, the Ph.D. programme is thoroughly revised with the feature that it has a broad-based course work with a number of advanced level topics courses to provide a good background to Ph.D. students and a system of qualifying examinations.

R & D Activities

Continuing with its tradition, the Department has further augmented its basic research, focusing in contemporary areas of fundamental, developmental and strategic importance, applied and interdisciplinary research and productive collaboration with industries and reputed R & D departments. The collaborating R & D institutions/organizations include: TIFR, IISc, ISI, ONGC, Institute of Mathematical Sciences etc., and foreign universities like Brunel University (U.K), Florida Technical University (USA), Colorado School of Mines (US), Humboldt University (Germany), CNRS-IML, Marseille (France), INSA, Toulouse (France), Univ. St-Etienne (France), l'Université Pierre et Marie Curie, Paris (France), Vilnius University, Lithuania, etc. and nodal organizations such as CSIR, DAE, DBT, DST, etc., for scientific exchange of ideas of national importance. In 2007-08, the Department has constituted a committee for promotion of research to boost its research activities. In order to fulfill the broad objectives of research activities, steps are taken to ensure that, the theoretical bases in emerging areas are strengthened, interdisciplinary problems requiring mathematical solutions are identified, interaction between Indian and overseas scientists are facilitated, local talents are well nurtured through lecture series and instructional workshops by evolving a pool of trained manpower in thrust areas. During this year, the department organized two year- long programmes, few distinguished lecture series, two international conferences, one national conference, one CIMPA workshop, two international workshops, several study group meetings in Statistics, several CEP courses and one instructional school. This year, three NBHM post-docs joined the Department and the Department has witnessed a steady increase in the number of quality publications.

Sponsored Projects

Ongoing

Algebraic methods in multivariable operator theory, IRCC.

Factorization of period integrals, IRCC.

A fast marching method for monotonically propagating fronts in an inhomogeneous moving fluid, IRCC.

Homogenization and defects in network structures, IRCC.

Establishing the analytic properties of automorphic L-functions, IRCC.

Obstruction theory for projective modules, IRCC.

Accelerated refinement schemes for computation of eigen elements of integral operators with singular kernels using wavelet Galerkin methods, Dept. of Science & Technology, Govt. of India.

Adaptive mixed finite element methods and applications, Dept. of Science & Technology, Govt. of India and DAAD, Germany.

Analytical and numerical study of non-linear gas dynamic waves, ISRO-IITB Space Technology Cell.

Quantum groups and topological quantum field theory, Dept. of Science & Technology, Govt. of India.

Design of component reliability test plans, their software development and a centre for quality and reliability (CQR), Dept. of Science & Technology, Govt. of India.

Extension and web implementation of PROPAINOR for ab-initio prediction and computational function-elucidation of 3-D structure of proteins, Dept. of Biotechnology, Govt. of India.

Instrumentation assisted decision support system deploying data mining techniques for pulse examination and diagnostics, Ministry of Information Technology, Govt. of India.

Consultancy Projects

Sanjeev Sabnis

Data Mining of Petroleum Exploration, BHP Billiton, Melbourne, Australia.

Co-Investigator: Prof G. Mohan, Dept. of Earth Sciences

Selection of forecasting granularity to maximize benefits of scheduling in service industries, Tata Consultancy Services, Mumbai.

Activities of Mathematics Association

Mathematics Olympiad

The annual Mathematics Olympiad is a mathematical talent search examination to bring out the mathematical skills among students. This year, it was organized by 70 Volunteers of M.Sc. & Ph.D. students on Feb 3, 2008. There were three levels in which first level is for class 8-10 students, second level is for class 11-12 and third one is for U.G students (IIT & NON-IIT). 780 students from about six hundred schools and colleges from all over Mumbai participated in this event. Separate Prizes were given to the winners of each level and participation certificate was given to each and every student.

Popular Lecture Series

During 2007-08, the Department organized 4 talks under the *popular lecture series*.

“An application of p-adic numbers”, **V. Srinivas**, Tata Institute of Fundamental Research, Mumbai.

“List-decoding reed-Solomon codes”, **Jaikumar Radhakrishnan**, TIFR, Mumbai.

“An Investor's Martingale Walk”, **M. G. Nadkarni**, University of Mumbai, Mumbai.

“On Some Statistical Aspects of Agreement Among Measurements”, **Bikas Kumar Sinha**, ISI, Kolkata.

Conferences, Workshops, CEP Courses, Study Group Meetings Organized by the Department

Baskar S.; Natraj Neela; Pani Amiya K.

“Instructional School on Partial Differential Equations”, May 28 -- June 23, 2007.

Kulkarni, Rekha P.

“International workshop on Approximate Solutions of Operator Equations and Eigenvalue Problems”, February 25--29, 2008.

Puthenpurakal, Tony J.; Verma, Jugal K.

“CIMPA Workshop and International Conference in Commutative Algebra”, January 1-11, 2008.

Rana, Inder K.

“TIME 2007, Second national Conference on Technology and Innovation in Math Education”, December 1--4, 2007.

CEP courses organized: Math for ECM, 2007, April 16--28, 2007. Professional Development for Mathematics Teachers, 24 February 2008.

Sabnis, Sanjeev V.

Initiated Statistics-Study group activity by involving statistics faculty from various colleges affiliated to University of Mumbai.

Shastri, Anant R.

“Golden Jubilee International Workshop and Conference in Geometry and Topology”, August 17--26, 2007.

Publications

Books/Chapters in Books

Joshi, K. D.

Revised edition of “Calculus for Scientists and Engineers – An Analytical Approach”, Narosa Publishing House, New Delhi.

Kulkarni, Rekha P., Kulkarni, S. R. and Pani A. K.

Editor of the Proceedings of the International Conference on “Topics in Functional and Numerical Analysis” held at I.I.T. Bombay during December 7 -- 9, 2005. The Proceedings were published as a special issue of ‘The Journal of Analysis’, Volume 14 (2006).

Pai, D. V.

“An Introduction to Wavelet Analysis”, Chapter 2 in: Lecture Notes of the 5th S.E.R.C. School on Special Functions and Functions of Matrix Argument: Recent Advances and Applications in Stochastic Processes, Statistics, Wavelet Analysis and Astrophysics, Centre for Mathematical Sciences, Pala Campus, Publication No.34. Edited by A.M. Mathai, CMS, Pala, Kerala, 55--80.

Pai, D. V.

“Wavelet Analysis: An Introduction”, in: Applied Mathematics, Instructional Lectures delivered in DST sponsored Instructional Workshop on Applied Mathematics, Edited by Uma Basu and B.N. Mandal, Narosa Publishing House, 244--261 (2008).

Papers in Proceedings

International:

Ahues, M.; Largillier, A.; Limaye, Balmohan V.

"On the acceleration of spectral computations for integral operators with weakly singular kernels", Proceedings of the Ninth International Conference on 'Integral Methods in Science and Engineering: Techniques and Applications' held at Niagara falls (Canada), Birkhauser, Boston, 9--16 (2007).

Kumar, Sarvesh; Nataraj, Neela; Pani, Amiya. K.

Finite volume element method for incompressible miscible displacements in porous media, Proc. Appl. Math. Mech., 7, 2020015--2020016 (2007).

Papers in Journals

International:

Abreu, A.; Elias, A.; Loza, M. A.; Mukhopadhyay, Siuli; Rueggeberg, F.

“Effect of metal type and surface treatment on in vitro tensile strength of copings cemented to minimally retentive preparations”, The Journal of Prosthetic Dentistry, 98, 199--207 (2007).

Athavale, Ameer; Chavan, S.

"Sectorial forms and unbounded subnormals", Math. Proc. Cambridge Philos. Soc., 143, 685--702 (2007).

Agnihotram, G.; Sabnis, Sanjeev V.;

“Reliability test plan for series systems in the presence of covariates”, *Economic Quality Control*, 22, No. 2, 197--209 (2007).

Bhattacharya, Amitava; Peled, Uri N.; Srinivasan, Murali K.

“Cones of closed alternating walks and trails”, *Linear Algebra and its Applications*, 423, 351--365 (2007).

Das, Ashish; De Los Reyes J. P.; Midha, C. K.

A matrix approach to construct magic rectangles of even order.

Australasian Jour. of Comb. (2008), 40, 293-300.

Dharmadhikari, A. D.; Sabnis, Sanjeev V.; Sinha, B. K.

“Construction of bounds in prototype testing”, *Journal of Statistical Theory and Applications*, 6, No. 3, 302--312 (2007).

Fairweather, G. ; Fernandes, R. I.; Pani Amiya K.

“Alternating direction implicit orthogonal spline collocation methods for an evolution with a positive-type memory term”, *SIAM J. Numer. Anal.*, 46, 344--364 (2008).

Gnana, Bhaskar, T.; Hariharan, S. ; Nataraj, Neela

“Heatlet approach to diffusion equation on unbounded domains”, *Applied Mathematics and Computation*, 197, 891--903 (2008).

Gudi, T. ; Nataraj, Neela; Pani, Amiya K.

“hp-discontinuous Galerkin methods for strongly nonlinear elliptic boundary value problems”, *Numer. Math.*, 109 (2008).

Gudi, T. ; Natraj, Neela; Pani, Amiya K.

“An hp-local discontinuous Galerkin method for some quasi-linear elliptic boundary value problems of non-monotone type”, *Math.Comp.*, 77, 731--756 (2008).

Iyengar, S.; Puthenpurakal, Tony J.

"Hilbert-Samuel functions of modules over Cohen-Macaulay rings" *Proceedings of American Mathematical Society*, 135, 637--648 (2007).

Jayanathan, A. V.; Puthenpurakal, Tony J. ; Verma, Jugal K.

"On fiber cones of m-primary ideals." *Canadian Journal of Math*, 59, 109--126 (2007).

Jena, J.; Sharma, Vishnu D.

"Interaction of a characteristic shock with a weak discontinuity in a relaxing gas", J. Engrg. Math., 60, No. 1, 43--53 (2008).

Joshi, Rajani R.

"Peptide vaccine models using statistical data mining" Protein Peptide Letters, 14, No. 6, 536--542 (2007).

Joshi, Rajani R.

"A decade of computing to traverse the labyrinth of protein domains", Current Bioinformatics, 2, 113--131 (2007).

Joshi, Rajani R.; Manda, C.

"Statistics of catalytic domain sequences in protein kinases vs non-kinases" Protein Peptide Letters, 14, No. 6, 518--527 (2007).

Joshi, Rajani R.; Samant, V. V.

"Bayesian data mining of protein domains gives efficient predictive algorithm and new insight", J. Molecular Model, 13, No. 1, 275--282 (2007).

Kumar, S.; Nataraj, Neela; Pani, Amiya K.

"Finite volume element method for second order hyperbolic equations", Int. J. Numer. Anal. and Modeling, 5, 132--151 (2008).

Mantri, P.; Nataraj, Neela; Pani, Amiya K.

"A quolocation method for Burgers' equation", J. Comp. Math. Appl., 21, No. 3, 1--13 (2008).

Mukhopadhyay, Siuli; Khuri, A. I.

"Comparison of designs for multivariate generalized linear models", Journal of Statistical Planning and Inference, 138, 169--183 (2008).

Pai, D. V.

"Strong unicity of restricted p-centers", Numerical Functional Analysis & Optimization, 29, No. 5-6, 638--659 (2008).

Puthenpurakal, Tony J.

"Ratliff-Rush filtration, regularity and depth of higher associated graded modules. I.", Journal of Pure and Applied Algebra, 208, 159--176 (2007).

Puthenpurakal, Tony J. ; Zulfeqarr, Fahed

"Ratliff-Rush filtrations associated with ideals and modules over a Noetherian ring", Journal of Algebra, 311, 551--583 (2007).

Raja, Sekhar T.; Sharma, Vishnu D.

"Similarity solutions for three dimensional Euler equations using Lie group analysis", Appl. Math. Comput., 196, No. 1, 147--157 (2008).

Rana, Inder K.; Sinha V.

"Fubini Type Theorems for BV integrals", Real Analysis Exchange, 33, No. 1, 109--214 (2008).

Sinha, K.; Sinha N.; Vellaisamy, P.

"Kronecker sum of binary orthogonal arrays", Utilitas Mathematica, 75, 249--257 (2008).

Trung, N. V.; Verma, Jugal K.

"Mixed volumes versus mixed multiplicities", Trans. Amer. Math. Soc., 359, 4711--4727 (2007).

Vellaisamy, P.; Vijay, V.

"Some collapsibility results for n-dimensional contingency tables", Annals of the Institute of Statistical Mathematics, 59, 557--576 (2007).

Vellaisamy, P.; Vijay, V.

"Collapsibility of regression coefficients and its extensions", Journal of Statistical Planning and Inference, 138, 982--994 (2008).

National:

Ahues, M.; Largillier, A.; Limaye, Balmohan V.

"A singularity subtraction iterative refinement scheme for spectral subspaces of weakly singular integral operators", J. Analysis, 14, 111--133 (2006).

Kulkarni Ravi, S.

Review of "Collected Works of V. Patodi", edited by M.F. Atiyah and M.S. Narasimhan, Mathematics Student, Indian Mathematical Society (2007).

"Dynamical types and conjugacy classes of centralizers in groups", J. Ramanujan Math. Soc. 22 (2007), no. 1, 35-36.

“Some curvature functions and their arithmetic properties”, J. Ramanujan Math Soc. 22 (2007), no. 1, 57-74.

Mukhopadhyay, Siuli; Khuri, A.I.

“Bias in multivariate generalized linear models”, Calcutta Statistical Association Bulletin, 59, 87--105 (2007).

Parcha, S. K.; Sabnis, Sanjeev V.; Saraswati, P. K.

“Taxonomic application of classification and regression tree (CART) and random forest (RF):

A case study of middle cambrian trilobites”, Journal of The Geological Society of India, 70, No. 6, 1033--1038 (2007).

Shastri, Anant, R.

“Complex Numbers and Plane Geometry”, Resonance, 35--53 (2008).

Participation in Conferences/Symposia

International

International

Anandavardhanan, U. K.

"Root numbers of Asai L-functions", Summer School and Conference on Automorphic Forms and Shimura Varieties, The Abdus Salam International Centre for Theoretical Physics, Trieste, July 9--27, 2007.

Garge, Shripad M.

Buildings and Groups, Ghent, Belgium, May 20--26, 2007.

Quadratic forms, triangulated categories and valuations, Lens, France, June 11--15, 2007.

International Conference on Automorphic Forms and Shimura Varieties, ICTP, Italy, July 9--27, 2007.

Motives of projective homogeneous varieties, Mainz, Germany, September 17--21, 2007.

Buildings 2007, Münster, Germany, October 8--11, 2007.

Ghorpade, Sudhir R.

First Symposium on Algebraic Geometry and its Applications (SAGA 2007), in honour of the 60th birthday of Gilles Lachaud, Papeete, Tahiti, French Polynesia, May 2007. Presented a paper entitled: "On the weight hierarchy of Grassmann codes".

Eleventh International Conference on Arithmetic, Geometry, Cryptography and Coding Theory (AGCT - 11), Centre International de Rencontres Mathématiques (CIRM), Luminy, France, November 2007. Presented an invited talk entitled "Decomposable subspaces, linear sections of Grassmann varieties, and higher weights of Grassmann codes".

Kulkarni, Ravi S.

Delivered one of the New world lectures at the 4th International Congress of Chinese Mathematicians, Hong-zhou, China, December 2007 entitled "Dynamical types and conjugacy classes of centralisers in groups".

Mukhopadhyay, Siuli

Design and Analysis of Experiments DAE 2007 Conference, Tennessee, USA October 2007. Presented: "Optimization in a Multivariate Generalized Linear Model Situation"

Pani, Amiya K.

International Congress of Industrial and Applied Mathematics (ICIAM-2007), ETH Zurich, Switzerland July 16--20, 2007 gave a talk on "Oldroyd Viscoelastic Model : Theoretical and Computational issues".

Raghunathan, Ravi

International Conference on automorphic forms and Shimura varieties, International Centre for Theoretical Physics, Trieste, Italy, July 23--27, 2007.

Rana, Inder K.

ATCM 2007 Asia Technology Conference in Mathematics, Taiwan December 16--20, 2007. Gave invited talk: Role of Technology in Math Education, Indian perspective.

Sabnis, Sanjeev V.

International Conference on Mathematical Methods on Reliability (MMR 2007), Glasgow, Scotland, July 1--4, 2007. Presented a talk on "Reliability Test Plans for Systems with Dependent Components".

Sharma, Vishnu D.

International Congress of Industrial and Applied (ICIAM-2007), ETH Zurich, Switzerland July 16--20, 2007.

Verma, Jugal K.

Invited international distinguished talk on “Hilbert functions of multigraded algebras, mixed multiplicities of ideals and their applications”, in the Fourth International Congress of Chinese Mathematicians, Hangzhou, China, December 2007.

National

Anandavardhanan, U.K.

Galois Representations and Modular Forms, Chennai Mathematical Institute, Chennai, September 24 -- October 4, 2007.

73rd Annual Meeting of the Indian Academy of Sciences, Thiruvananthapuram, November 1--4, 2007.

Arithmetic Geometry, NCBS, Bangalore, March 23--29, 2008.

Das, Ashish

10th Conference of the Society of Statistics, Computer and Applications held at St. Thomas College, Pala, Cochi during 16-18, November 2007.

Presented an invited talk on “Some statistics of cheque collections in India”.

Garge, Shripad M.

K-theory and algebraic cycles, Chennai, January 15--17, 2008.

Ghorpade, Sudhir R.

Golden Jubilee Meeting on Geometry and Topology, Indian Institute of Technology Bombay, Mumbai, August 2007. Member of the Organising Committee.

International Conference on Recent Advances in Mathematics and its Applications, Belgaum, Karnataka, September 2007. Presented an invited plenary lecture entitled “Geometric, combinatorial and coding theoretic aspects of subspaces of a vector space”.

Eleventh International Conference on Arithmetic, Geometry, Cryptography and Coding Theory (AGCT - 11), [Centre International de Rencontres Mathématiques \(CIRM\)](#), Luminy, France, November 2007. Presented an invited talk entitled “Decomposable subspaces, linear sections of Grassmann varieties, and higher weights of Grassmann codes”.

Seventeenth Symposium on Applied algebra, Algebraic algorithms, and Error Correcting Codes (AAECC-17), Indian Institute of Science, Bangalore, December 2007. Chaired a session.

CIMPA School on Commutative Algebra, Indian Institute of Technology Bombay, January 2008. Chaired a session.

Seventy third Annual Conference and the Centenary Celebrations of the Indian Mathematical Society, Pune, December 2007. Presented an invited talk entitled "Higher weights of Grassmann codes" in the Symposium on Coding Theory at this conference.

Joshi, Rajani R.

Nonparametric Statistics in Computational Biology. Invited talk at *All India Symposium on Computational Biology*. Maulana Azad National Inst. Tech., Bhopal (April 06--08, 2007).

Keshari, Manoj Kumar

CAAG VII, ISI Bangalore, July 2007. Invited talk on "Projective modules over Discrete Hodge algebras".

Keshari, Manoj Kumar

Gave an invited talk on "Projective modules over Discrete Hodge algebras" in CAAG VII, ISI Bangalore, July 2007.

Kulkarni, Rekha P.

Invited lecture "Approximate solution of the second kind integral equations with Green's kernel" in the International Conference on Functional Analysis and its Applications held at Scott Christian College, Nagercoil, November 28 -- December 1, 2007.

Limaye, Balmohan V.

Gave a talk on "Integral Operators with Weakly Singular Kernels" in the International Conference on 'Functional Analysis and its Applications' held at Scott Christian College, Nagercoil, Kerala, November 28 -- December 1, 2007.

Limaye, Balmohan V.

Gave a talk on "Uniformly Well-Conditioned Bases for Spectral Subspaces" in the International Workshop on 'Approximate Solutions of Operator Equations and Eigenvalue Problems', held at IIT Bombay from February 25--29, 2008.

Puthenpurakal, Tony J.

CIMPA workshop and International Conference in Commutative Algebra, IIT Bombay, Jan 1--11, 2008.

Invited talk on "Upper bound of Multiplicity conjecture" in Commutative Algebra and Algebraic Geometry Conference; held at ISI Bangalore, July 16--20 (2007)

Rana, Inder K.

Conference in Mathematics Education and Technology 2007, Delhi Public School, Delhi. Invited talk on "Teaching with Technology"

Sabnis, Sanjeev V.

International Conference on Reliability, Safety and Quality Engineering, BARC, Mumbai, January 5--7, 2008. Presented: An Overview of Construction of Optimal Reliability Test Plans.

International Conference on Present Practices and Future Trends in Quality and Reliability (ICONQR08), Indian Statistical Institute, Kolkata, Jan.22-25, 2008. Presented: Construction of Optimal Reliability Test Plans for Coherent Systems with Independent and Non-identical Components.

National Conference on Industrial Statistics, Dept. of Statistics, Univ. of Pune, August 4-6, 2008. Presented: Modeling of Panel Data using Hierarchical Bayesian Methodology and Metropolis-Hastings Algorithm

National Seminar on Statistical Methods and Reliability Analysis, Cochin University of Science and Technology, Cochin, January 28--30, 2008. Presented: Reliability Test Plans for k-out-of-n and Bridge systems.

Verma, Jugal K.

Mixed Multiplicities, mixed volumes of polytopes and a new proof of Bernstein's theorem, Symposium on geometry and topology, 74th annual meeting of the Indian Mathematical Society, University of Pune, December 2007.

Hilbert-Samuel polynomials, six lectures, Workshop in Commutative Algebra and Algebraic Geometry IIT Madras, June 2007.

"Hilbert functions and powers of ideals", CAAG VII, ISI Bangalore, July 2007.

Invited Lectures

International

Garge, Shripad M.

"Gelfand models for finite Coxeter groups", Buildings 2007, Münster, Germany, October 8--11, 2007.

Kulkarni, Ravi S.

"Poincare Conjecture", University of Mumbai

"Subgroups of the Modular group", University of Mumbai,

Kulkarni, Rekha, P.

Invited lecture series of 6 lectures on "approximate solutions of operator equations" in the Indo-French Spring school held at Jean Monet University, Saint Etienne, France, June 11--15, 2007.

Limaye, Balmohan V.

Gave seven invited lectures on 'Functional Analysis' in the Indo-French Spring School held at Saint-Etienne, France, June 11--15, 2007.

Mukhopadhyay, Siuli

Optimization in multivariate generalized linear models, design and analysis of experiments DAE 2007 Conference, Tennessee, USA, October 2007.

Pani, Amiya. K.

Oldroyd model of viscoelastic flow : theoretical and computational issues, in the International Congress of Industrial and Applied Mathematics (ICIAM-2007), ETH Zurich, Switzerland July 16--20, 2007.

Discontinuous Galerkin methods : An Old Wine in a New Bottle, in the Graduate Seminar held in Humboldt University, Berlin, June 2007.

Finite element approximation of the equations of motion arising in the Oldroyd model, Colloquium talk, Berlin, June 2007.

Sharma, Vishnu D.

Delivered a lecture on nonlinear resonantly interacting waves in a Special Session of the American Mathematical Society (AMS) on Wave Propagation from Numerical and Analytical View Points held at DePaul University, Chicago, USA, October 5, 2007.

Delivered a lecture on the evolutionary behavior of shocks in a relaxing fluid in AMS-special session on Mathematical/Computational Aspects of Compressible Flow Problems held at the University of New Mexico, Albuquerque, USA, October 13, 2007.

Delivered a lecture on weakly nonlinear waves to the Applied Mathematics Group, Department of Mathematics, Stanford University, USA, January 11, 2008.

National

Anandavardhanan, U. K.

Serre's Conjecture (3 lectures), Galois Representations and Modular Forms, Chennai Mathematical Institute, Chennai, September 24 -- October 4, 2007.

Baskar, S.

“Numerical Methods to Scalar Conservation Laws” (4 lectures), Instructional School in PDEs, IIT Bombay, May 28 – June 23, 2007.

Ghorpade, Sudhir R.

“Introduction to algebraic geometry”, Short Term Training Programme on Advances in Control Theory, Veermata Jijabai Technological Institute (VJTI), Mumbai, October 2007.

“Development of calculus and real analysis”, Annual Mathematics Day of the Harish-Chandra Mathematics Society, Deen Dayal Upadhyaya College (University of Delhi), New Delhi, November 2007.

“Complex problems in coding theory”, Scientific Analysis Group, Defence Research and Development Organisation, Delhi, November 2007.

“Some aspects of coding theory”, Jamia Millia Islamia, New Delhi, November 2007.

“On the development of calculus and real analysis”, Karnataka University, Dharwad, December 2007.

“Introduction to coding theory”, Workshop on Mathematics for Engineers, D. J. Sanghvi College of Engineering, Vile Parle, Mumbai, February 2008.

Joshi, Kapil D.

Gave a series of lectures at the ATML school by NBHM at the Bhaskaracharya Pratishthan, Pune, May 2007

Gave a series of lectures at Banasthali University, Rajasthan, March 2008.

Joshi, Rajani R.

Nonparametric Statistics in computational biology. Invited Talk at National Workshop on Advanced Methods for Protein Bioinformatics. Bose Institute, Kolkata, March 3--5, 2008.

New paradigms of holistic health care — Role of information technology. Series of three Talks at Tata Consultancy Services, Pune.

ANN applications in molecular recognitions. Invited Talk at SERC School on Machine Learning and Pattern Evolution Methods for Chemo and Bioinformatics. C-DAC, Pune, June 29--30, 2007.

Kulkarni, Rekha, P.

"Improvement by iteration" in the International workshop on "Approximate solutions of operator equations and Eigenvalue problems", I.I.T. Bombay, February 25--29, 2008.

Limaye, Balmohan V.

Gave an invited lecture on 'Zabreiko's result on the continuity of countably subadditive seminorms' at the Cochin University of Science and Technology, December 3, 2007.

Neela, Nataraj

A series of lectures on Finite element methods for elliptic PDEs in the Instructional School on Modern PDEs held during May 28 - June 23, 2007.

Pai, Devidas V.

One hour, "On strong uniqueness of best simultaneous approximation" (Colloquium Lecture), Department of Mathematics, Sardar Patel University, Vallabh Vidyanagar, Gujarat, September, 2007.

One hour, "Strong unicity of restricted Chebyshev centers" (Departmental Colloquium), Department of Mathematics, IIT Bombay, August 23, 2007.

One hour, "On well-posedness and regularization in variational analysis" (Special Colloquium Lecture), Instructional School on Modern PDE's, Department of Mathematics, IIT Bombay, June 2007.

A compact instructional lecture course series consisting of 4 lectures of duration 2 hours each and 3 problem sessions of duration 2 hours each for two consecutive days on Wavelet Analysis in: DST sponsored 5th S.E.R.C School on Special Functions and Functions of Matrix Argument held at Centre For Mathematical Sciences (CMS), Pala Campus, Pala, Kerala-686574, India, May 2007.

Pani, Amiya K.

Two hour talk on "How to compute fair price in an American option: A case study from finance." Institute of Mathematics and its Applications, Bhubaneswar, February 2008.

Navier-Stokes Equation : A million dollar open problem, in IIT Kharagpur, March 2008.

A series of lectures on Finite Element Methods for Parabolic Problems: in the Instructional School of Modern PDE held during May-June 2007.

Ranjan, Akhil

A set of 6 lectures on Differential Geometry at Vanasthali Vidyapeeth.

Shastri, Anant R.

Attended an International Workshop/Conference on Recent Advances in Mathematics at Kittur Chennamma Post Graduate Center, Karnatak University, Belgaum, September 24--29, 2007 and gave an invited talk on "3- dimensional Poincare Conjecture".

Attended Annual Meeting (Conference) of Ramanujan Mathematical Society and presented a survey type talk on “Topology of Algebraic Varieties”.

Sista, Sivaji Ganesh

Delivered lectures on Complex Analysis at Mathematics Training & Talent Search programme, Mumbai, May--June, 2007.

Delivered lectures on Ordinary Differential Equations in Annual Foundation School - I, IIT Kanpur, December 2007.

A series of lectures on ‘Theory of Homogenization’ in the Instructional School on Modern PDEs during May 28 – June 23. 2008.

Srinivasan Murali K.

“Vershik-Okouukov approach to the representation theory of the symmetric groups” in Advanced instructional school on representation theory and its applications, July 2007.

Verma, Jugal K.

Reforms in the Ph. D. Programme and establishment of a Center for Mathematical Sciences at IISER, Mohali. For a rapid transformation of Ph.D. programmes in universities in Punjab, Workshop on Education and Research in Punjab, IISER, Mohali, Feb 2008.

Honorary Work

Anandavardhanan, U. K.

Reviewer for MathSciNet and Zentralblatt MATH

Athavale, Ameer

Reviewed 2 papers for Mathematical Reviews.

Garge, Shripad M.

Reviewer for Zentralblatt MATH.

Ghorpade, Sudhir R.

Referee for the IEEE Transactions of Information Theory, Resonance and the International Journal of Information and Coding Theory.

Member, Faculty Selection Committee of a NIT and the Assessment Committee of the Directorate of Technical Education, Maharashtra State.

Joshi, Rajani R.

Reviewed Papers submitted to “Proteins – Structure, Function, Bioinformatics”, “BioMed Central Structural Biology”, “Protein Peptide Letters” and “Royal Society Journal – Interface”.

Reviewed Research Project Proposals (in Biostatistics, Computational Biology, or in Statistical and Mathematical Modeling in Biology & Medicine) submitted to DBT/DST and Indo-French Centre for the Promotion of Advanced Research.

Kulkarni, Ravi S.

Editor in chief of RMS Lecture Notes series.

A member of the Programme Advisory Committee - Mathematical Sciences (DST).

A member of the Guidelines Committee for Distinguished Ramanujan Chairs, (DST).

Kulkarni, Rekha P.

Refereed a thesis.

Mukhopadhyay, Siuli

Reviewed papers submitted to “Computational Statistics and Data Analysis”.

Nataraj, Neela

Member of Organizing Team of Olympiad conducted by Mathematics Association, IIT Bombay.

Pai, Devidas V.

Member, DST appointed subgroup for C.R. Rao Advanced Institute of Mathematics, Statistics and Computer Science (AIMSC), Hyderabad, India.

Member, (UGC nominee), Advisory Committee for Special Assistance Programme (SAP) DRS for Department of Mathematics, Sardar Patel University, Gujarat.

Member, Project Management and Monitoring Committee (PMMC) for the DST sponsored 5-year project entitled “Evolving Core Group Research Facilities at Banaras Hindu University”.

Pani, Amiya K.

Continued to work as a member of five international journals, reviewed manuscripts in SIAM J. Numer. Anal., IMA J. Numer. Anal. etc.,

Member of selection committee of NITs and universities.

Project evaluation for DST, Indo- French Collaborations etc., and Examiner of one thesis from IIT and three theses from Universities.

Puthenpurakal, Tony J.

Refereed papers for Mathematische Zeitschrift, Journal of Algebra, Communications in Algebra, Proceedings for Indian Acad. Sci, Indian Journal of Pure and Applied Mathematics

Reviewer for Math Reviews and Zentralblatt Math.

Raghunathan, Ravi

Reviewer for Mathematical Reviews.

Ranjan, Akhil

Member selection committee at NIT Kurukshetra.

Sabnis, Sanjeev V.

Evaluated two Ph.D. theses from the University of Calcutta and Shivaji University, Kolhapur.

Sharma, Vishnu D.

Appointed Member of the Following National Committees:

- 1.CSIR-Committee for recommending nominees for the Bhatnagar Award (2007).
- 2.INSA- Committee for recommending nominees for the Young Scientist Award (2007).
- 3.INSA Sectional Committees (On Mathematical Sciences-I, and Multidisciplinary Sciences-M1) for recommending nominees to the Election of INSA Fellows (2007).

Verma, Jugal K.

Secretary, Advanced Training in Mathematics Schools, National Board for Higher Mathematics.

Trustee, Bhaskaracharya Institute of Mathematics.

Member, Scientific Committee and Organizing Committee, CIMPA School and International Conference in Commutative Algebra, IIT Bombay, January 2008.

Significant Awards and Distinctions

Anandavardhanan, U. K.

Selected as an Associate of the Indian Academy of Sciences, Bangalore.

Puthenpurakal, Tony J.

Received BOYSCAST fellowship from DST.

Mukhopadhyay, Siuli

Junior Researcher Award, Design and Analysis of Experiments DAE 2007 Conference, Tennessee, USA.

Srinivasan, Gopal

Excellence in Teaching Award 2007.

Ghorpade, Sudhir R.

Member, Editorial Board, International Journal of Information and Coding Theory, Interscience Publishers, U.K.

Member, Council of Editors, Resonance, Indian Academy of Sciences, Bangalore and Springer, New York.

Joshi, Rajani R.

Selected as editor of international journal *Protein Peptide Letters* for the special issues on “Protein Informatics and Drug Designing”.

Pai, Devidas V.

Member, Editorial Board, Asian-European Journal of Mathematics, World Scientific, Singapore and Imperial College Press, UK.

Pani, Amiya K.

Panel member representing the South Asian Countries in the panel discussion on 'Developing Mathematics in Developing World' on July 19, 2008 in the International Congress of Industrial and Applied Mathematics (ICIAM-2007), ETH Zurich, Switzerland.

Member of the Editorial Board of five national and international journals.

Visitors

Golden Jubilee Distinguished Lecture Series

“Linguistics, Drumming and Mathematics”, **Manjul Bhargava**, Department of Mathematics, Princeton University, USA.

Discovering the same things in two such different ways: Indian and Western Calculus”, **David Mumford**, Division of Applied Mathematics, Brown University, USA.

“Geometry, Nonlinear Analysis and Theoretical Physics”, **S.-T. Yau**, Departemet of Mathematics, Harvard University, USA.

Institute Colloquia

“P. R. Halmos: My Teacher – The best in the business”, **V. S. Sunder**, Institute of Mathematical Science, Chennai.

“Playing with cards and hats - data transmission and coding theory”, **Michel Waldschmidt**, Universite Pierre et Marie Curie, Paris.

Department Colloquia and Seminars

By Department Faculty

“Strong unicity of restricted Chebyshev centers”, **D. V. Pai**.

“Geometric, combinatorial and coding theoretic aspects of subspaces of a vector space”, **S. R. Ghorpade**.

By Other Visitors

“Spectral stochastic methods” (A series of lectures), **Dr. Didier Lucor**, UPMC Universite de Paris-6.

“Quillen’s proof of Serre’s conjecture” (A series of lectures), **S. M. Bhatwadekar**, TIFR, Mumbai.

“Convergence of orbital measures”, **S. Shrihari**, Institute of Mathematical Science, Chennai.

“On volichenko algebras”, **Uma Iyer**, Bronx Community College, USA.

“Elasticity of elasticity”, **K. Rajagopal**, University of Texas, USA.

“Optimization in multivariate generalized linear models”, **Siuli Mukhopadhyay**, Department of Biostatistics, Medical College of Georgia, USA.

“Bayesian inference for zero-inflated count data”, **Archan Bhattacharya**, Department of Statistics, University of Georgia, USA.

“Quantum field theory as an aid to geometers”, **Katrin Wendland**, University of Augsburg, Germany.

“A brief review of tight closure theory”, **Rajasekhar Bhattacharyya**, .

“Phantom exactness, flatness and phantom homology”, **Rajasekhar Bhattacharyya**, .

“The Birch and Swinnerton-Dyer conjecture”, **Amod Agashe**.

“What is logical consequence?”, **Rohit Parikh**, City University of New York, USA.

“Ramanujan graphs and optimal expander graphs from algebraic geometric codes”, **Heeralal Janwa**, University of Puerto Rico, San Juan, Puerto Rico.

“Nonparametric Bayesian estimation – Some challenges”, **Eswar Phadia**, William Paterson University of New Jersey, USA.

“Maximin universally optimal designs in the presence of a trend”, **Dibyen Majumdar**, University of Illinois at Chicago, USA.

“Componentwise linear and integrally closed ideals”, **M. E. Rossi**, Universita di Genova, Genova, Italy.

“Evolutionarily robust strategies: Two nontrivial examples and a theorem”, **A. J. Shaiju**, University of New Southwales, Australian Defence Force Academ, Canberra.

“Learning functions on the sphere”, **H. N. Mhaskar**, California state university, Los Angeles, USA.

“Real elements in spin groups”, **Anupam Kumar Singh**, Institute of Mathematical Science, Chennai.

“Spectrum and Arithmetic”, **C. S. Rajan**, TIFR, Mumbai.

“Riemann and his zeta function”, **Peter Zvengrowski**, University of Calgary, Canada.

“Design of Factorial experiments” (A series of lectures), **Aloke Dey**, Indian Statistical Institute, New Delhi.

“Combinatorial representation theory”, **A. Joseph Kennedy**. Pondicherry University.

“Partition algebras”, **A. Joseph Kennedy**. Pondicherry University.

“Early history of irrational and transcendental numbers”, **Michel Waldschmidt**, Universite Pierre et Marie Curie, Paris.

Golden Jubilee Colloquium Series in Mathematics

“Perelman's noncollapsible estimate on Ricci Flow”, **Richard Hamilton**, Columbia University, USA.

“Spacetime with Torsion”, **S.-T. Yau**, Harvard University, USA.

“All About "Statistics" You Wanted to Know”, **B. L. S. Prakasa Rao**, University of Hyderabad.

“Gauss Composition Laws and their applications”, **Manjul Bhargava**, Department of Mathematics, Princeton University, USA.

“What's an infinite dimensional manifold and how can it be useful in hospitals?”, **David Mumford**, Division of Applied Mathematics, Brown University, USA.

Distinguished Lecture Series

“Navier-Stokes Equations: Solvability, Control and Stochastic Analysis” (A series of lectures), **Sivaguru S. Sritharan**, University of Wyoming, USA during Dec.2007 – Jan. 2008 under year long programme on New Trends in PDEs : Theory and Computations.

“Statistical Surveillance : Issues, models and methods with applications”, **Bikas Kumar Sinha**, Indian Statistical Institute, Kolkata.

“Temperley-Lieb Algebras”, **V. S. Sunder**, Institute of Mathematical Sciences, Chennai.

“An introduction to II_1 factors and subfactors”, **V. S. Sunder**, Institute of Mathematical Science, Chennai.

“Lectures on inference for stochastic processes”, **B. L. S. Prakasa Rao**, University of Hyderabad, Hyderabad.

Year Long Programme on New Trends in PDEs: Theory & Computations

“An evolution operator (in integral form) for the solution of a Cauchy problem for the wave equation”, **Phoolan Prasad**, IISc. Bangalore.

“The method of moving planes”, **S. Kesavan**, Institute of Mathematical Science, Chennai.

“Factorization principle in homogenization”, **M. Vanninathan**, TIFR, Bangalore.

“Navier Stokes Equations: A million dollar open problem”, **Amiya Kumar Pani**, IIT Bombay, Mumbai.

“Far field boundary conditions and its numerical approximation”, **A. S. Vasudeva Murthy**, TIFR Bangalore.

“Homogenization of low cost control problems in perforated domain”, **A. K. Nandakumaran**, IISc, Bangalore.

“Wellposedness and regularization in variational analysis”, **D. V. Pai**, IIT Bombay, Mumbai.

“How to compute a fair price for an option derivatives: A case study”, **Amiya Kumar Pani**, IIT Bombay, Mumbai.

“On quasilinear hyperbolic equations and systems”, **V. D. Sharma**, IIT Bombay, Mumbai.

“Nonlinear Fuchsian equations”, **Gopal K. Srinivasan**, IIT Bombay, Mumbai.

“Some remarks on the convergence of adaptive finite element methods”, **Carsten Carstensen**, Humboldt University, Germany.

“Computational Modelling of Thermoforming Processes for Viscoelastic Polymer Sheets, with Applications to thermo-plastic starch”, **John R. Whiteman** (FRSA), Brunel University (UK) during January 2008.

Under this year long programme four-weeks long Instructional School on Modern PDEs was also organized during May – June 2007 and the following talks were given by experts :

“Theory of Distributions”, **S. Kesavan**, IMS, Chennai

“Sobolev Spaces”, **M. Vanninathan**, TIFR, Bangalore

“Scalar Conservation Laws”, **Phoolan Prasad**, IISc Bangalore

“Elliptic PDEs”, **A. K. Nandakumaran**, IISc Bangalore

“Evolution Equations”, **A. S. Vasudevamurthy**, TIFR, Bangalore

“Semigroup Theoretic Approach to PDEs”, **N. Sabu**, IIT Bombay

“Numerical Solutions to Scalar Conservation Laws”, **S. Baskar**, IIT Bombay

“System of Hyperbolic Equations”, **Gopal K. Srinivasan**, IIT Bombay

“Viscosity Methods”, **K. S. Mallikarjun**, IIT Bombay

“Theory of Homogenization”, **Sivaji Ganesh Sista** and **N. Sabu**, IIT Bombay

“Financial Modelling”, **N. Hemachandra**, IIT Bombay

“Stochastic Process and Option Derivatives”, **Suresh Kumar**, IIT Bombay

“Finite Element Methods (Elliptic PDEs, Mixed Methods), MATLAB session”,

Neela Nataraj, IIT Bombay

Finite Element Methods (Evolution Equations), Discontinuous Galerkin Methods, Problem Solving Sessions, **Amiya Kumar Pani**, IIT Bombay

Year Long Programme on Geometry and Topology

Lecture series on “Group Cohomology”, **A. R. Shastri**.

Lecture series on “3-Manifolds”, **A. R. Shastri**.

Lecture series on “Vector bundles, flag manifolds and Stiefel manifolds”, **Peter Zvengrowski**, **University Calgary, Canada**.

Lecture series of five lectures on " Topological methods in the study of bilinear forms",

K. Y. Lam, **University of British Columbia, Canada**.

Lecture series of five lectures on: "Wall obstructions", **K. Varadarajan**, **University Calgary, Canada**,

Lecture series of five lectures on: "Group theoretic methods in fixed point theory".

Peter Wong, **Bates College, USA**.

Lecture series of five lectures on: "Introduction to L2 cohomology".

Peter Zvengrowski, **University Calgary, Canada**.

Under this programme International Workshop and International Conference were also organized during August 2007.

Statistics Study Group

This year, a statistic study group activity was initiated by evolving faculty members from various colleges in Mumbai. The group focused on reading research articles dealing with concepts and results taught at undergraduate level. The following talks were presented under this study group meeting. .

“The inequality between the coefficient of determination and the sum of squared simple correlation coefficients”, **K. G. Rajan**, M. V. L. U, College, Andheri, Mumbai.

“Moments of discrete probability distributions derived using finite difference operators”, **Shailaja Deshmukh**, K. C. College, Churchgate, Mumbai.

“Alternative proofs for properties of correlation coefficient”, **Amrit Rajwadkar**, Mithibai College, Vile Parle, Mumbai.

“A note on the best linear unbiased estimation based on order statistics”, **Shailaja Deshmukh**, KC College, Mumbai.

“Reliability test plans for systems with dependent components”, **Sanjeev Sabnis**, IIT Bombay, Mumbai.

“Small sample interval estimation of Bernoulli and Poisson parameters”, **Alok Dabade**, Mithibai College, Mumbai.

“A delta method for obtaining asymptotic distribution”, **Sanjeev Sabnis**, IIT Bombay, Mumbai.

“The two-sample T test with one variance unknown”, **Amrit Rajwadkar**, Mithibai College, Mumbai.

“An overview of resampling methods”, **Ashish Das**, IIT Bombay, Mumbai.

“Bootstrap test of stochastic equality of two populations”, **Alok Dabade**, Mithibai College, Mumbai.

“Approximate median regression via box-cox transformation”, **Sanjeev Sabnis**, IIT Bombay, Mumbai.

List of Faculty and Specializations

1. **Athavale, Ameer** - Indiana University - *Functional Analysis*
2. **Anandavardhanan, U.K.** - University of Hyderabad - *Number Theory*
3. **Das, Ashish** – IARI New Delhi - *Design of Experiments*
4. **Baskar, S.** – IISc Bangalore - *Hyperbolic Conservation Laws: Theory, Numeric and Applications*
5. **Garge, Shripad M.** – HRI Allahabad - *Number Theory, Linear Algebraic Groups*
6. **Ghorpade, Sudhir R.** - Purdue University - *Algebraic Geometry, Combinatorics*
7. **Joshi, Kapil D.** - Indiana University - *Topology, Discrete Mathematics*
8. **Joshi, Rajani R.** - IIT Bombay; UTC, Compiegne - *Computational Biology, Biostatistics and Bioinformatics*
9. **Keshari, Manoj Kumar** - TIFR Mumbai - *Commutative Algebra (Projective modules)*

10. **Kulkarni, Rekha P.** - IIT Bombay; JFU, Grenoble - *Numerical Functional Analysis, Spline Theory*
11. **Limaye, Balmohan V.** - University of Rochester - *Functional Analysis, Numerical Analysis, Spectral Approximation*
12. **Mahajan, Swapneel** - Cornell University – *Geometry and Topology*
13. **Mukhopadhyay, Siuli** - University of Florida - *Statistics*
14. **Nataraj, Neela** - IIT Delhi - *Finite Element Methods*
15. **Pai, Devidas V.** - IIT Bombay - *Functional Analysis, Approximation Theory, Set-valued Analysis*
16. **Pani, Amiya K.** - IIT Kanpur - *Numerical Analysis, Partial Differential Equations, Industrial Mathematics*
17. **Puthenpurakal, Tony J.** - Purdue University - *Commutative Algebra*
18. **Raghunathan, Ravi** - Yale University - *Automorphic forms, Number Theory*
19. **Raman, Preeti** – TIFR Mumbai - *Number Theory*
20. **Rana, Inder K.** - ISI Delhi - *Harmonic Analysis, Mathematics Education*
21. **Ranjan, Akhil** - TIFR Mumbai - *Differential Geometry*
22. **Kulkarni, Ravi S.** – Harvard University - *Differential Geometry*
23. **Sabnis, Sanjeev V.** - Old Dominion University - *Reliability Theory, Industrial Statistics*
24. **Sharma, Vishnu D.** - BHU Varanasi - *Quasilinear Hyperbolic Systems of PDEs/ Nonlinear Waves*
25. **Shastri, Anant R.** - TIFR Mumbai - *Algebraic Geometry, Algebraic Topology*
26. **Singh, Balwant** – TIFIR Mumbai – *Commutative Algebra*
27. **Sista, Sivaji Ganesh** – IISc Bangalore - *Partial Differential Equations*
28. **Sivasubramanian, S.** – TIFR Mumbai - *Combinatorics*
29. **Srinivasan, Gopal K.** - University of Minnesota - *Partial Differential Equations*
30. **Srinivasan, Murali K.** - Univ. of Illinois at Chicago - *Combinatorics*
31. **Subramanyam, A.** - University of Pune - *Statistical Inference, Geostatistics*
32. **Sureshkumar, K.** – IISc Bangalore - *Stochastic Differential Game Theory, Mathematical Finance.*
33. **Vellaisamy, P.** - IIT Kanpur - *Applied Probability, Statistical Inference, Industrial Statistics*
34. **Verma, Jugal K.** – Purdue University – *Commutative Algebra*