IIT BOMBAY
DEPARTMENT OF MATHEMATICS
ANNUAL REPORT (YEAR 2005-2006)

The year witnessed excelled contributions and achievements of faculty and students research in — Fundamental and Applied areas of Mathematics, Scientific Computing and Statistics; Interaction with Industry and noted National and International Institutes, Universities and Organizations; and Extended educational activities beyond the departmental Academic Programmes.

The major events include – Prof. S.C. Bhattacharya Award for Pure Sciences, 2005 conferred upon the HoD, Prof. VD Sharma; organization of an International Conference on *Functional and Numerical Analysis*, First National Seminar on *Technology and Innovations in Mathematics* and Year Long Special Programmes on *Computational PDEs* and *Number Theory*. List of distinguished speakers under these special year-long programmes includes Robert P. Langlands, Institute for Advanced Study, Princeton, U.S.A. J. Cooper, President & CEO, Mapplesoft, Canada, and Professor Olivier Pironneau, Fellow of French Academy of Sciences Universite de Paris VI and IUF and Professor K. W. Morton Former Professor, Oxford University

Along with its ongoing national and international projects on industrial R &D, the Industrial Mathematics Group (IMG) of the department had organized annual Indo-UK Study Group Meeting cum Workshop on Industrial Problems at M S University Baroda in collaboration with Oxford Center for Industrial and Applied Mathematics (OCIAM), UK. This was the third joint meeting in a series initiated by the IMG.

Academic Programmes

Besides the teaching of B. Tech. Courses, the department offers M.Sc. and Ph.D. programmes along with its research activity. It has two distinct M.Sc. programmes. M.Sc. in Mathematics (intended for those who wish to pursue research and/or teaching as their career) and M.Sc. in Applied Statistics and Informatics (ASI). The latter commenced in 1997, has been a success story and a trend-setter for some other IITs and Universities.

In addition, the Department has a research programme leading to Ph.D. degree. This programme has a broad-based course work and specialization in Pure Mathematics, Applied Mathematics, Scientific Computing, and Statistics.

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, ISRO, DRDO, ONGC, Inst. Math. Sci., Indian Meteorological Center, etc., and Foreign Universities like Brunel (U.K), Florida Technical University (USA), Humboldt University, Berlin, Technical University, Dresden, CNRS-IML, Marseille (France), INSA, Toulouse (France), Univ. St-Etienne (France), etc and nodal organizations such as CSIR, DAE, DBT, DST, etc., for scientific exchange of ideas of national importance. In order to fulfill the broad objectives of research activities, steps are taken to ensure that, the theoretical base 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 and by evolving a pool of trained manpower in thrust areas.

Sponsored Projects

Joshi R.R.
Project Title: Software Development for *ab-initio* Prediction of 3D structure of Proteins using Knowledge-Based Nonparametric Regression
Sponsoring Agency: Dept. of Biotechnology, Govt. of India.
Amount generated: Rs. 11.76 Lakhs
Year: 2003-2006

Kulkarni R.P. & Limaye B.V.
Project Title: Accelerated Refinement Schemes for computation of eigenelements of integral operators with singular kernels using wavelet Galerkin methods
Sponsoring Agency: Dept. of Science & Technology, Govt. of India.
Amount generated: 6.84 Lakhs
Year: 2005-2008

Patkar Sachin and Pani AK
Project Title: WebOPT
Sponsoring Agency: European Union ASIA-ITC
Amount generated: 400,000 Euros
Year: 2003-2006

Pani A.K.
Project Title: Adaptive Mixed Finite Element Methods and Applications
Sponsoring Agency: DST-DAAD (PPP-05)
(with Professor Dr. Carsten Carstensen, Germany)
Amount: 12,24000/-
Year: 2005-2007
Project Title: Physical and Numerical Models for Unconventional Flood Patterns
Sponsoring Agency: IRS, ONGC (Ahmedabad)
(with Sushant K. Mitra, Mech. Engg. Dept. and Madhu Venjamur, Chem. Engg. Dept.)
Amount: 2.16 crore
Year: 2005-2007

Sharma V.D.
Project Title: Analytical and Numerical studies of Non-linear Gas dynamic waves.
Sponsoring Agency: ISRO-IITB Space technology cell.
Amount generated: 14 Lakhs
Year: 2005-2007

Subramanyam A. & Suresh Kumar K.
Project Title: Stochastic modeling, analysis and optimization of resource allocation.
Sponsoring Agency: ISPC.
Amount generated: Rs.5.7 lakhs
Beginning Year: 2003
End Year: 2005

Vellaisamy P. V
Project Title: Design of Component Reliability Test Plans
Sponsoring Agency: DST
Amount generated: Rs. 6.984 lakhs
Year: 2005-2007

Verma J.K. & Putehnpurakal, T.J.
Project Title: Monomiale Ideals, Blowup algebras and convex polytopes.
(with J. Herzog, Germany & T. Hibi, Japan)
Sponsoring Agency: Deutche Forschungsgemeinschaft (DFG).
Amount: 18,000 Euros.
Year: 2006

Consultancies

Patkar Sachin & Sabnis S.V.
Project Title: Time Series Modelling of ATM Data
Sponsoring Agency: Zafin Labs, Mumbai

Sabnis S.V
Project Title: Statistical modelling of TRP Ratings
Sponsoring Agency: TNS India Pvt. Ltd, Mumbai

Extension Activities

Special Year of *Mathematics Education & Mathematics Awareness*
Co-ordinator: Prof. I.K. Rana

Year Long Programme on *Computational Partial Differential Equations*.

Special Year on Number Theory (NT05): Elliptic Curves, Automorphic forms and L-functions. (Ongoing activity till August 2006).

List of Faculty and Specializations

Ameer Athavale (Professor)
Functional Analysis

Anandavardhanan U.K. (Assistant Professor)
Number Theory

Ghorpade Sudhir R. (Professor)
Algebraic Geometry, Combinatorics

Gupta Jayanthi (Visiting Faculty)
Biostatistics

Joshi K. D. (Professor)
Topology, Discrete Mathematics

Joshi Rajani R. (Professor)
Computational Biology, Biostatistics and *Bioinformatics*

Keshari Manoj Kumar (Senior Lecturer)
Commutative Algebra (Projective modules)

Kulkarni Rekha P. (Professor)
Numerical Functional Analysis, Spline Theory

Limaye Balmohan V. (Professor)
Functional Analysis, Numerical Analysis, Spectral Approximation

Neela Nataraj (Assistant Professor)
Finite Element methods

Pai Devidas V. (Adjunct Faculty)
Functional Analysis, Approximation Theory, Set-valued Analysis

Pani Amiya K. (Professor)
Numerical Analysis, Partial Differential Equations, Industrial Mathematics

Patkar Sachin B. (Associate Professor)
Combinatorial Optimization, Algorithms

Prajapat J. (Assistant Professor)
Partial Differential Equations, Differential Geometry, Geometric Analysis

Prasad Dipendra (Adjunct Faculty)
Number Theory

Puthenpurakal T.J (Assistant Professor)
Commutative Algebra

Raghunathan Ravi (Assistant Professor)
Automorphic forms, Number Theory

Rana Inder K. (Professor)
Harmonic Analysis, Mathematics Education

Ranjan Akhil (Professor)
Differential Geometry

Sabnis S. V. (Associate Professor)
Reliability Theory, Industrial Statistics

Sharma V.D. (Professor)
Quasilinear Hyperbolic Systems of PDEs/ Nonlinear Waves

Shastri A. R. (Professor)
Algebraic Geometry, Algebraic Topology

Srinivasan Anitha (Senior Lecturer)
Number Theory

Srinivasan G. K. (Assistant Professor)
Partial Differential Equations

Srinivasan M. K. (Professor)
Combinatorics

Subramanyam A. (Associate Professor)
Statistical Inference, Geostatistics

Sureshkumar K. (Assistant Professor)
Stochastic Differential Game Theory, Mathematical Finance.

Vellaisamy P. (Professor)
Applied Probability, Statistical Inference, Industrial Statistics

Verma J. K. (Professor)
Commutative Algebra

Conferences & Workshops Organized by the Department:

International Conference (in the honor of Prof. B.V. Limaye) on Topics in Functional and Numerical Analysis. December 7-9, 2005.
Conveners: Prof. R. P. Kulkarni and Prof. A.K. Pani.

First National Seminar "TIME 2005" on Technology And Innovations in Mathematics. December 4-6, 2005.
Convener: Prof. I.K. Rana

Advanced Instructional School in Commutative Algebra and Algebraic Geometry. Sponsored by the National Board for Higher Mathematics, IIT Bombay.
Conveners: Prof. N. Nitsure, Prof. A.R. Shastri & Prof. J.K. Verma

Instructional School on Computational PDE's, 5-24th June 2005
Conveners: Pani A.K., Nataraj Neela .

11th Workshop inMathematics, 11-15th Novemebr, 2005 and 24-26th December, 2005
Convener: Prof. I.K. Rana

Book Publications

Ghorpade S. R. Srinivasan H. and **Verma J. K.** (Eds). *Commutative Algebra and Algebraic Geometry, Contemporary Mathematics*. Vol. 390. American Mathematical Society, Providence, RI, 2005. [ISBN: 0-8218-3629-3]

Pai, D.V. and K. Indira, Hausdorff Strong Uniqueness in Simultaneous Approximation. PartII, in:``Frontiers in Interpolation and Approximation" (Eds.) N.K. Govil, H.N.Mhaskar, R.N. Mohapatra, Z. Nashed, and J. Szabados, 2006,Taylor & Francis Books, Boca Raton, Florida, USA

Joshi M. C. Joshi, **Pani A. K.** and **Sabnis S.V.** (Eds.) *Industrial Mathematics*. Narosa Publishing house, New Delhi (2006).

Publication in Journals

International:

Athavale Ameer
On a Friedrichs extension related to unbounded subnormal operators, Glasgow Mathematical Journal, Vol. 48, pp. 19-28, (2006).

(with Sameer Chavan)

Ananadavardhanan U.K
Distinguished representations, base change, and reducibility for unitary groups, Int. Math. Res. Not. Vol. 14, 841-854, (2005).

(with C.S Rajan)

Ghorpade S.R.
Schubert varieties, linear codes and enumerative Combinatorics, Finite Fields and their Applications, Vol. 11, no. 4, pp. 684-699, (2005).

(with M. A. Tsfasman)

Joshi R.R.
Structure Prediction of a Multi-domain EF-hand Ca^{2+} Binding Protein by PROPAINOR J. Mol. Mod**.** Vol. 11, pp. 481-488, (2005).

(with S. Jyothi, Mustafi S.M., and Chary KVR)

Diagnostics Using Computational *Nadi* Patterns. Math. Comp. Mod. Vol. 41(1), pp. 33-47, (2005).

Kulkarni R.P
A new superconvergent collocation method for eigenvalue problems. Math. Comp. Vol. 75, no. 254, 847-857, (2006).

A superconvergent projection method for nonlinear compact operator equations. C. R. Math. Acad. Sci. Paris Vol. 342, no. 3, 215-218, (2006).

(with Grammont, Laurence)

On improvement of the iterated Galerkin solution of the second kind integral equations. J. Numer. Math. Vol. 13, no. 3, 205-218, (2005).

Neela Nataraj

A parallel mixed finite element implementation FOR Approximation of eigenvalues and eigenvectors of fourth order eigenvalue problems, Journal of Sound and Vibration, Vol. 285, pp. 1242-1254, (2005).

(with Kshitij Kulsreshtha)

Pai D.V.
Pai,D.V., Strong Unicity of Order Two in Simultaneous Approximation, The Mathematics Student, Vol. 71, 113-121, (2003) (appeared in 2005).

Pani A.K.
Orthogonal cubic spline collocation method for the extended Fisher-Kolmogorov equation, J.Computational and Appl. Math. Vol. 174, pp. 101-117, (2005).

(with P. Dhanumjaya).

Numerical methods for the extended Fisher-Kolmogorov Equation. Intl. J. Numer. Anal & Modeling, Vol. 6, pp.186-210 (2006).

(with P. Dhanumjaya).

On a linearized backward Euler method for the equations of motion of Oldroyd fluids of order one. SIAM J. Numer. Anal. Vol. 44, pp. 804-825, (2006).

(with Jin Yun Yuan, P.D. Damazio).

Patkar Sachin

Distributed Decision Support System and Various Algorithms for Scheduling in Heat Treatment Plant for Bearings Journal : WSEAS Transactions on Systems, Vol. 4, Issue 6, Volume 4, pp. 854-863, (2005).

(with B.R.S.M. Jothi)

Submodular Theory Based Approaches For Hypergraph Partitioning, WSEAS Transactions on Circuit and Systems, Vol. 4, Issue 6, pp. 647-655, (2005).

(with Abhijit Deshpande, H. Narayanan)

Prajapat J.

Positive solution branch for elliptic problems with critical indefinite nonlinearity. Differential Integral Equations Vol. 18, no. 7, 721-764, (2005).

(with Giacomoni, Jacques, Ramaswamy, Mythily)

Stationary Isothermic surfaces and uniformly dense domains. Electron. Published by Transactions of AMS on April 11, 2006.

(with R. Magnanini, S. Sakaguchi)

Puthenpurakal T. J.
A short note on the non-negativity of partial Euler characteristics. Beiträge Algebra Geom. Vol. 46, no. 2, 559-560, (2005).

The Hilbert function of a maximal Cohen-Macaulay module. Math. Z. Vol. 251, no. 3, 551-573, (2005).

Invariance of a length associated to a reduction. Comm. Algebra Vol. 33, no. 6, 2039-2042, (2005).

Raghunathan Ravi
Product Identities for L-functions, Ill. Jour. Math., Vol. 49, no. 3, 885-891, (2005).

(with K. Joshi)

Sabnis S.V.
Reliability test plan for parallel systems having stochastic failure rates, IAPQR Transactions, Vol.30, no.1, 33-42, (2005).

(with Hariharan Nair)

Sharma V.D.
Nonlinear wave propagation through a stratified atmosphere. J. Math. Anal. Appl. Vol. 311 no. 1, 13-22, (2005).

(with Madhumita, G)

Similarity solutions for strong shocks in an ideal gas. Stud. Appl. Math. Vol.114, no. 4, 375-394 (2005).

(with Arora Rajan)

Wavi interaction in Non-Equilibrium gas flow. Int. J. Nonlinear Mechanics, Vol 40 pp. 1031-1040, (2005).

(with G.K. Srinivasan)

Srinivasan Anitha
Prime producing quadratic polynomials and class number 1 or 2, Ramanujan Journal, Vol 10, no.1, pp.5-22, (2005).

Solutions of some Generalized Ramanujan- Nagell Equations. Indagationes Mathematicae N.S. Vol. 17(1), 103-114, (2006).
(with N. Saradha)

Subramanyam A
Tests of Independence in a bivariate exponential distribution, Metrika Vol. 61, pp. 47-62, (2005).

(with Usha A. Kumar)

Suresh Kumar K.
Differential games of fixed duration in the framework of relaxed strategies, DEDS, Vol. 13, pp. 251-273, (2005).

(with M.K Ghosh A.K. Nandakumar and K.S.M. Rao)

Vellaisamy P.V.
A unified approach for Modelling and Designing attribute sampling plans for monitoring dependent production prousses, Methodology and Computing in Applied Probability, Vol. 7, pp. 307-323, (2005).

(with S. Sankar)

Verma J.K
Hilbert coefficients and depth of fiber cones. J. Pure Appl. Algebra Vol. 201, no. 1-3, 97-115, (2005).

(with A. V. Jayanthan)

Papers in Proceedings

(National)

Pani AK
A nonlinear gas-liquid system in sliding motion. *Differential Equations and Dynamical Systems*. Ed. D. Bahuguna. Narosa Publ. House, New Delhi (2005)
(with J. Agrawal and Kannan Moudgalya).

Finite element method for extended Fisher-Kolmogorov (EFK) equation. *Differential Equations and Dynamical Systems*. Ed. D. Bahuguna. Narosa Publ. House, New Delhi (2005)
(with P. Dhanumjaya).

Semidiscrete qualocation method for the Stefan problem. *Industrial Mathematics*. Eds. M.C. Joshi, A. K. Pani and S.V. Sabnis. Narosa Publishing House, New Delhi (2006), pp.105-120.
(with L. Jones Doss).

(International)

Ananadavardhanan U.K.
Distinguished non-Archimedean representations. Algebra and number theory, 183--192, Hindustan Book Agency, *Delhi*, 2005.

Neela Natraj
Performance of a mixed finite element implementation for fourth order clamped amisotropic plate bending problems in SIMD distributed memoery environments, Proceedings of ICIWIM 2002, NAROSA, 2006, 265-278.

Patkar Sachin
Paper Title: Algorithms for Scheduling of Data Transfer across FPGAs in a Grid
Authors : Janak Porwal and Sachin Patkar
Conference : The 2005 International Conference on Engineering of Reconfigurable Systems and Algorithms (ERSA'05: June 27-30, 2005, Las Vegas, USA)

Paper Title:
Authors : Janak Porwal, Sachin Patkar and Chandra Poojari
Conference : PLANSIG-2005, London, UK

Prajapat Jyotshana

Positive solution branch for elliptic problems with critical indefinite nonlinearity. Recent advances in elliptic and parabolic problems, *81--95,* World Sci. Publ., Hackensack, NJ, 2005.

Puthenpurakal Tony J.
An analogue of a theorem due to Levin and Vasconcelos. Commutative algebra and algebraic geometry, 9-15, Contemp. Math., 390, Amer. Math. Soc., Providence, RI, 2005. 13D05

Presentation / Participation in Conferences/ Symposia.

National:

Ghorpade S.R
Title: Instructional School in Commutative Algebra and Algebraic Geometry, IIT
Organizer: NBHM (venue: IIT Bombay)
Duration: July 2005.

Chairman of a session (President du seance) during the International Conference on Arithmetic, Geometry and Coding Theory (AGCT-10) held at the Centre International de Rencontres Mathématiques (CIRM), Luminy, France, September 2005

Limaye B.V.
Title: Conference on Functional Analysis and its Applications.
Organizer: Sarder patel University
Duration: March 14-16, 2005
Details: Delivered lecture on Continuity and Countable Subadditivity of a Seminorm.

Natraj Neela
Title: Golden Jubilee Conference in Analysis and Applications
Organizer: IISc Bangalore
Duration: March, 2006

Title: National Symposium on Scientific Computing with Applications to Partial Differential Equations (NSSCAPDE05)
Organizer: IIT Kanpur
Duration: November, 2005

Title: Instructional School on Computational Partial Differential Equations.
Organizer: NBHM
Duration: June 5-24, 2005

Pani A. K.
Title: National Symposium on Scientific Computing with Application to Partial Differential Equations.
Organizer IIT Kanpur.
Duration: November 19-21, 2005

Title: National Seminar on Partial Differential Equations and Scientific Computing
Organizer: South Gujarat University, Surat
Duration: January 23-25, 2006.

Chaired a whole day session and also chairing the valedictory session in the National Seminar on PDE and Scientific Computing, Veer Narmada South Gujarat University, Surat January 23-25, 2006.

Chaired a session in National Symposium on Scientific Computing with Application to Partial Differential Equations. IIT, Kanpur, Nov,, 19-21, 2005.

Prajapat Jyothsana
Title: Instructional School on Computational Partial Differential Equations
Organizer: Department of Mathematics, IIT Bombay
Duration: June 5-24, 2005

Title: National Seminar on Mathematical Analysis and Applications.
Organizer: Periyar University, Salem.
Duration: October 6-7,2005

Rana I.K.

Title: National Conference on Mathematics Education.
Organizer: NCERT, New Delhi.
Duration: December, 2005.

Shastri A.R.
Title: National Symposium on Analysis and its Applications
Organizer: University of Dharwar
Duration: 22-25 March, 2006
Details: Delivered a talk on Lagrange- Bettrami identities and Gauss elimination

Title: Workshop on Topology
Organizer: ISI, Kolkata
Duration: December 1-31, 2005
Details: Co-ordinator and Speaker

Title: Workshop in Commutative Algebra and Algebraic Geometry
Organizer: Dept. of Mathematics, IITB
Duration: 4-30 July, 2005
Details: Coordinator

Vellaisamy P. V

Title: ISPS Conference
Organizer: Bangalore University.
Duration: December 27-30, 2005

Verma J.K

Tilte: Solving systems of polynomial equations:theorems of Stickelberger and Bernstein,
Organizer: M. S. University of Baroda,
Duration: 4 March, 2006.

Title: Hilbert coefficients and depth of fiber cones,
Organizer:Institute of Mathematical Sciences,
Duration: 1-6 August, 2005.

Title: Workshop in Commutative Algebra and Algebraic Geometry
Organizer: Dept. of Mathematics, IITB
Duration: 4-30 July, 2005
Details: Coordinator

International:

Athavale Ameer
Topic: Operator Theory and Operator Algebras III
Organizer: ISI & IISc Bangalore
Duration: December 19-22, 2005
Details: Delivered an invited talk titled “Sectorial Forms and Unbounded Subnormals”

Ananadavardhanan U.K
Topic: Representation of Real Reductive Groups
Organizer: TIFR Mumbai
Duration: January 2-5, 2006.

Ghorpade S.R.
Title: International Conference on Arithmetic, Geometry and Coding Theory (AGCT-10)
Also chaired a session.
Organizer: Centre International de Rencontres Mathématiques (CIRM), Luminy, France
Duration: September 2005.

Title: Special Session on Commutative Rings and Algebras
Organizer: Southeastern Sectional Meeting of the American Mathematical Society, Johnson City, USA
Duration: October, 2005.

Limaye B.V.
Title: Topics in Functional and Numerical Analysis.
Organizer: IIT Bombay
Duration: December 7-9, 2005
Details: Delivered a talk on singularity subtraction refinement scheme for spectral spaces of weakly singular operations (Authored jointly with M.Ahues and A. Largillier)

Natraj Neela
Title: Conference on Difference and Differential equations
Organizer: Florida Technical University
Duration: August, 2005

Prajapat Jyotshana

Title:Indo-UK Study Group Meeting on Industrial Problems
Organisers: M.S.University, Vadodara
Duration:March 20-24, 2006

Puthenpurakal Tony J.
An analogue of a theorem due to Levin and Vasconcelos. Commutative algebra and algebraic geometry, 9-15, Contemp. Math., 390, Amer. Math. Soc., Providence, RI, 2005. 13D05

Sabnis S.V.
Gave an invited talk on "Case studies involving statistical applications in Indian industry" at the Third Mathematics in Industry Study Group Meeting held at University of Witwatersrand, Johannesburg, South Africa on 24th January 2006.

Sharma V.D.
Title**:** New perspective for BVPs and their asymptotics
Organizer: University of Texas-Pan American, USA.
Duration: May17, 2005.
Details: Delivered a talk on Weakly nonlinear resonantly interacting waves.

Srinivasan Anitha
Title: Diophantine Equations
Organizer: Dion
Duration: December 2005

Vellaisamy P.V
Title: German open Conference on Probability and Statistics.
Organizer: Goethe Universitat, Frankfurt am main, Germany
Duration: March 14-17, 2006

Verma J.K.
Title: International Conference in Commutative Algebra
Organiser: Institute of Mathematics, Hanoi, Vietnam
Duration: Jan 2-6, 2006

Invited lectures

Athavale Ameer
Delivered a number of lectures on "Fourier Series and Functional Analysis" at a Summer Workshop held at the Bhaskaracharya Pratishthana, Pune, India in December 2005 under a National Board for Higher Mathematics (India)-sponsored scheme titled Advanced Training in Mathematics Schools

Ghorpade S.R
A Series of three lectures, on "Linear codes and projective varieties". Algebra Seminar, The University of Tennessee, Knoxville, USA, September 2005.

Seminar on "Codes and enumeration with applications to algebraic geometry". Algebra & Discrete Mathematics Seminar, Clemson University, Clemson, South Carolina, USA, November 2005.

" Seminar on Schubert varieties, determinantal varieties and Hilbert functions". University of Missouri, Columbia, USA, November 2005.

Colloquium talk titled "Geometric and combinatorial aspects of determinantal equations". State University of New York (SUNY) at Albany, USA, December 2005.

A series of six lectures on "Equations over finite fields. Refresher Course on Finite Fields and their Applications". University of Mumbai, Mumbai, March 2006

Joshi K. D
Gave a series of 4 lectures at the Department of Mathematics, Shivaji University, Kolhapur , March 27-28, 2006.

Joshi R.R.
Invited Lecture on Bioinformatics – New Computational Approaches, (APPOGY, 23-26 March, 2006, BITS Pilani).

Invited lecture series on ANN nad Baysesian Machine Learning Techniques in Structural Biology (BIC and IBB, Pune, March 3-4, 2006)

Kulkarni R.P.
Delivered lectures in the refresher course held at the University of Kerala, Trivendrum, in March 2006.

Invited Lecture on "Approximate Solution of Operator Equations" University of Cochin, on March 2, 2006.

Limaye B.V.
Seminar talk at the university of Porto (Portugal) on 16 May, 2005 on "Zabreiko's result on countably subadditive seminorms".

Minicourse of three lectures at the university of Porto (Portugal) on " Accelerated Spectral Approximation", 16-17 May, 2005.

Invited talk at the University of St- Etienne (France) on 26 May 2005 on "Theorems in Functional Analysis Revisited".

Pai D.V.

Half-hour survey lecture titled: On Well-posedness and Regularization of Minimization Problems. In the 37th Meeting of the Programme Advisory Committee on

Mathematical Sciences(PAC-MS) of SERC, DST, Govt. of India held at Jaipur, India in March, 2006.

Pani A.K.
Discontinuous Galerkin Methods for Elliptic PDEs, in the National Symposium on Scientific Computing with Application to Partial Differential Equations during November 19 to 21, 2005 at IIT- Kanpur.

Navier-Stokes Equations: A Million Dollar Open Problem, in the National Symposium on Scientific Computing with Application to Partial Differential Equations during November 19 to 21, 2005 at IIT- Kanpur.

A New Mixed Finite Element Method for Evolution Problems: An Old Wine in a New Bottle, Humboldt University, Berlin December, 2005.

On a priori and A posteriori Error Analysis of Local Discontinuous Galerkin Methods, Humboldt University, Berlin December, 2005.

How to Compute Fair Price in an American Option: A Case Study in the National Seminar on Partial Differential Equations and Scientific Computing, held in Veer Narmad South Gujarat University, Surat during January 23-25, 2006,

Millenium Open Problems in the National Seminar on Partial Differential Equations and Scientific Computing, held in Veer Narmad South Gujarat University, Surat during January 23-25, 2006,

Prajapat Jyotshana

Colloquim at ISI Bangalore, Dec. 2005.

Sabnis S.V

Delivered 6 lectures on "Probability Theory" in the DST sponsored Workshop organized by Prof. Rana during December 24-26, 2005.

Gave 4 talks at Kendriya Vidyalaya Teachers' Training Program on "Basic Statistics" during 20th-21st May, 2005.

Lecture on "Construction of reliability Test Plans in the presence of Covariates" on 28th June, 2005 ISI Kolkata.

Verma J.K.

"Hilbert functions of multigraded algebras. Eight lectures" in the Commutative Algebra Seminar at IIT Bombay, Jan-March, 2006.

"Galois theory", Eight lectures in the, Second Annual Foundation School-Part I, Bhakaracharya Pratishthana and University of Pune,10-20 Dec, 2005.

"Matrix groups". Four lectures in XI Workshop in Mathematics, Indian Institute of Technology Bombay,10-15 November, 2005.

"Hilbert coefficients and depth of form rings", Four lectures in the Commutative Algebra Seminar, IIT Bombay, September, 2005.

"Cohen-Macaulay rings", Six lectures in the Advanced Instructional School in Commutative Algebra and Algebraic Geometry, Indian Institute of Technology Bombay, 4-30 July, 2005.

"Hoskin-Deligne formula and blow-up algebras", Colloquium at University of Osnabrueck, Germany, 24 June 2005.

"Zariski's theory of complete ideals", Colloquium at University of Duisberg-Essen, 20 June, 2005.

"Complete ideals", Colloquium at University of Bochum, Germany, 19 June 2005.

"Zariski's theory of complete ideals", Four lectures at University of Duisberg-Essen, 14-21 June, 2005.

CEP Programmes / Industry Interaction

Pani A.K.

One of the three Conveners of the Indo-UK Study Group Meeting on Industrial Problems which is jointly organized by IMG, IIT Bombay, MS University, Baroda and OCIAM (Oxford Center for Industrial and Applied Mathematics), Oxford in MS University Baroda during 20-24th March, 2006.

Prajapat Jyotshana

Participated in the Indo-UK study group meeting; was a resource person and worked on the following problem.
Problem: Geometric Modeling of Tyre Profile

Industry: Apollo Tyre Ltd.,Vadodara

Contribution: Complete solution to the problem was obtained.

Rana I. K.

Conducted CEP programme ECM 2005 on “Mathematics for Economics, Commerce and Management” at IIT Bombay, 16-30th April, 2005.

Sabnis S.V.

Conducted one-day workshop on “Analytics for Marketing Intelligence” for a group of employees of Gillette Management Inc. on 14th May 2005 at Middlesex, London.

Invited as one of the overseas participants to take part in the Third Mathematics in Industry Study Group meeting held from Jan. 23-27 2006 at the University of the

Witwatersrand, Johannesburg, South Africa. I acted as a resource person and worked on the following problem.

Problem: HIV Modelling in a labor force
Industry: Mining industry
(Industry representatives: Medical practitioners in the industry)
Contribution: Predictor Model was developed.

Significant Awards and Distinctions

Athavale Ameer

Visited Bucknell University, Pennsylvania, USA from Jan 20, 2006 to Jan 27, 2006 under the ``Distinguished Visiting Professor'' Programme of the Department of Mathematics, Bucknell University and delivered a couple of talks in Operator Theory.

Pani A. K.

Member of the Editorial Board of

*International J. of Differential Equations and Dynamical Systems: Theory, Applications
* International J. Numerical Analysis and Modelling
* Journal of Applied Mathematics and Computing
* Journal of Functional Analysis and Approximation Theory
* Journal of Orissa Mathematical Society

A member of Academic Advisory Committee of the National Seminar on Partial Differential Equations and Scientific Computing. Veer Narmad South Gujarat University, Surat, Jan. 23-25, 2006

Pai D.V.

Appointed as a Member, Scientific Committee-Indian side of Indo-French Institute of Mathematics(IFIM) by DST, Govt. of India

Sharma V.D.

Recipient of Prof. S.C. Bhattacharya Award for Pure Sciences, 2005, awarded by IIT Bombay for research contributions in the area of PDEs and Non-linear waves**.**

Nominated as a Member of the Board of studies for the Department of Mathematics at BHU (Varanasi) from 2004-2007 and the Indian school of Mines Dhanbad from 2005-2008.

Honorary work

Athavale Ameer
Continues to review research papers for Mathematical Reviews**.**

Anandavardhanan U.K
Reviewer for Mathscinet, American Mathematical Society
Refereed a paper for "International Journal of Number Theory".

Ghorpade S.R.
Member, Council of Editors, Resonance, A Journal of Science Education published by the Indian Academy of Sciences, Bangalore.
Co-opted Member, Board of Studies in Mathematics: University of Mumbai [2000-2005], University of Pune [2001-2006].
Referee for a thesis for M.Sc. (by research) submitted to the University of Mumbai, 2005.
Referee for the Elsevier journal Finite Fields and Applications.
Reviewer for Zentralblatt MATH.

Joshi R.R.
Reviewer for project submitted to DBT and DST
Reviewer for papers submitted to (i) Nucleic Acid Research, (ii)AtmosphericEnviron
Member of Faculty Selection Committee at Univ. of Poona.

Kulkarni R.P.
Referee work for one paper and one thesis.
Co-opted Member, Board of Studies in Mathematics, University of Mumbai, 2005-2009.

Natraj Neela
Reviewer for Calcolo, Journal of The Indian Institute of Science

Pai D.V.
Worked as a Member, Programme Advisory Committee for Mathematical Sciences(PAC-MS) of SERC, DST, Govt. of India

Pani A.K.
Reviewed four Ph. D. theses, evaluated few projects under DST, CSIR
Naval Research etc., member of selection committee etc.

Reviewer of several Journals including Numerical Methods of PDEs, SIAM J . Numer. Anal., IMA J. Numer. Anal., Indian J. Pure and Applied Mathematics etc.

One of the three Conveners of the Indo-UK Study Group Meeting on Industrial Problems which is jointly organized by IMG, IITB, MS University, Baroda and OCIAM (Oxford Center for Industrial and Applied Mathematics), Oxford. MS University Baroda, 20-24 March, 2006.
One of the Co-ordinators of the Instructional School on Computational PDEs. June, 2006.
One of the conveners of the Year Long Programme on Comoutational PDEs

Patkar Sachin B
Member of Expert Committee for deigning Curriculum at IGNOU
Refree for Maths of OR, IPL.

Prajapat Jyotshana
Reviewer for Mathscinet, American Mathematical Society

Raghunathan Ravi
Reviewer for Mathematical Reviews

Sharma V.D.
Reviewer for Mathematical Reviews (USA) and Zentralblatt MATH (Germany).
Member of the Selection Committee for faculty recruitment at IIT Delhi, University of Delhi and NIT (Punjab).
Member of the Selection committee for CSIR and NBHM scholars.
Evaluated Ph.D. Thesis from IIT Kharagpur.

Shastri A.R.
Written several Review for Math Review.

Srinivasan M.K
Referee for research papers

Vellaisamy P. V
Evaluated Ph.D. Thesis of Bharathiar University, University of Mysore & IIT Kharagpur

Verma J.K.
Reviewer for Mathematical Reviews
Secretary for the NBHM suppored Advanced Training in Mathematics Schools
Member of the Nurture Programme committee of the NBHM.
Member of Board of studies of University of Baroda
Member of the council of editors of Resonanace

VISITORS:

Institute Colloquium
Speaker: Robert P. Langlands, Institute for Advanced Study, Princetion, U.S.A.
Title: The Legacy of Dr. Harishchandra – Representation Theory…

Departmental Colloquiums and Seminars:

Speaker: Siamak Yassemi, University of Tehran and Institute of Physics and Mathematics, Tehran, Iran
Topic: Gorenstein Dimension
Topic: Local Cohomology (Colloquium)

Speaker: Siamak Yassemi, University of Tehran and Institute of Physics and Mathematics, Tehran, Iran
Topic: Gorenstein Dimension
Topic: Local Cohomology (Colloquium)

Speaker: P. Purnaprajna, Univeristy of Kansas
Topic: Koszul cohomology, Syzygies and Geometry

Speaker: K. B. Athreya, Cornell University, Ithaca, U.S.A.
Topic: Brownian Motion, Ito calculus and the Black-Scholes formula

Speaker: Leslie Saper, Duke University, North Carolina, U.S.A
Topic: L2-harmonic Forms on Locally Symmetric Spaces

Speaker: Prof. Ravi Kulkarni, Harish-Chandra Research Institute, Allahabad
Topic: 1.Evolution of the idea of Curvature
2.Evolution of the idea of Curvature

Speaker: Dr. Jyotsna Prajapath, Department of Mathematics, IIT Bombay
Topic: Symmetry and classification of solutions of semilinear equations in the Heisenberg group

Speaker: Prof. P. N. Kaloni, Department of Mathematics, University of Windsor, Windsor, Canada
Topic: Convective Instability Of Magnetic Fluids

Speaker: Prof. L. Coburn, Department of Mathematics, SUNY (Buffalo), USA
Topic: Lipschitz estimates for Berezin's operator calculus

Speaker: Dr. Shripad Garge, School of Mathematics, TIFR
Topic: Arithmetic of algebraic groups

Speaker: Prof. Ian H, Sloan, Fellow of the Australian Academy of Sciences
University of New South Wales, Sydney (Australia)
Topic: Approximating and Designing on the Sphere

Speaker: Dr. Swapneel Mahajan, Department of Mathematics, IIT Bombay
Topic: Quantum groups and Differential Forms

Speaker: Dr. Siddhartha Bhattacharya, School of Mathematics, TIFR
Topic: Measurable rigidity of algebraic actions.
Speaker:Dr. Kiran M. Kolwankar, Max Planck Institute for the Mathematics in the Sciences, Leipzig, Germany
Topic: 1. Local fractional calculus for fractals
2. Local fractional calculus for fractals

Speaker: Dr. Manoj K. Yadav, Harish-Chandra Research Institute, Allahabad
Topic: Finite Groups with Many Product Conjugacy Classes.

Speaker: Dr. Jayanti Gupta, Independent Consultant to Pharmac. Co.
Topic: Using Prior Information to Determine the Sample Size in Equivalence Trials

Speaker: Prof. N. V. Kalpakam, IIT Guwahati
Topic: Boehmians and Integral transforms

Speaker: Prof. K. Jeyakumar, University of Calicut
Topic: α-Binomial and related distributions

Speaker: Dr. Tony Puthenpurakal, Department of Mathematics, IIT Bombay
Ttile: Ratliff-Rush Filtration, regularity and depth of Higher Associated graded modules

Speaker: Dr. A. Sitaram, I.S.I Bangalore
Topic: Some questions in integral geometry

Speaker: Prof. Jonathan Farley, Center for International Security and Cooperation,
Stanford University, USA
Topic: Beauty and Terror: Does Mathematics Have a Role to Play in Counterterrorism?

Speaker: Dr. Javad Asadollahi (Shahre-Kord University, Iran)
Topic: Gorenstein Homological Algebra

Speaker: Prof. Jonathan Farley, Department of Mathematics, IIT Bombay
Topic: Linear Extensions of Ranked Posets, Enumerated by Descents: A Problem of Stanley from 1981

Speaker: Dr. Bhabani Dandapat, Indian Statistical Institute (Calcutta)
Topic: A realistic approach to Stretching sheet flow problem and its possible extension to thin film flow

Speaker: Dr. Meera Mainkar, TIFR
Topic: Anosov automorphisms on compact nilmanifolds associated with graphs

Speaker: Prof. Steven Dale Cutkosky, University of Missouri (Columbia)
Topic: Toroidalization of morphisms of 3-folds.

Speaker: Prof. Hema Srinivasan, University of Missouri (Columbia)
Topic: Multiplicity bounds - recent developments
Speaker: Prof. Steven D'Silva (Carnegie Mellon University)
Topic: Time-Consistent and Currency-Invariant Convex Risk Measures

Speaker: Prof. Marcello Lucia, TIFR (Bangalore Centre)
Topic: Properties of Principal Eigenvalues

Speakers: Prof. Steven Dale Cutkosky, Hema Srinivasan, Steven D'Silva, Marcello Lucia
Topic: 1.Toroidalization of morphisms of 3-folds.
2. Multiplicity bounds - recent developments.
3.Time-Consistent and Currency-Invariant Convex Risk Measures
4. Properties of Principal Eigenvalues.

Speaker: Dr. U. K. Anandavardhanan, School of Mathematics, TIFR
Topic: Distinguished Representations

Speaker: Prof. C.S. Aravinda, Chennai Mathematical Institute
Topic: Rigidity in nonpositive curvature: Topological vs Smooth

Speaker: Prof. M. K. Srinivasan, Dept. of Math., IIT Bombay
Topic: The Eulerian generating function of q-derangements

Speaker: Prof. J. Herzog, University of Essen-Duisburg
Topic: Grobner bases in commutative algebra and combinatorics I

SEMINARS UNDER SPECIAL YEAR ON *Mathematics Education & Mathematics Awareness*:
Speaker: Prof. M. S. Raghunathan, FRS (London), Chairman, NBHM
Topic: Mathematics, The Queen of Sciences.

Speaker: Rob Knapp
Topic: Exploring the Power of Mathematics and Science using Maple & Maple Toolbox

Speakers: L. Bernadrdin, Chief Sci. & Head of R & D, Mapplesoft, Canada
J. Cooper, President & CEO, Mapplesoft, Canada
F. Kern, VicePresident, Mapplesoft, Canada
Topic: Harnessing the Power of Mathematics using Maple & Maple Toolbox

SEMINARS UNDER SPECIAL YEAR ON *Computational Partial Differential Equations* (CPDE-05)

Speaker: Prof. Laurence Grammont, University of Saint-Etienne (France)
Topics: A New Projection Method: Existence and Superconvergence.

Speaker: Dr. Hossein Azari, Inst. Theoret. Phys. & Math., Teheran, Iran.
Topic: Recovering a Time Dependent Coefficient in a Parabolic Differential Equation
Speaker: Prof. K. Moudgalya, Chem. Engg., IIT Bombay
Topic: Mathematical Model of a Class of Industrial Systems.

Speaker: Dr. Jyotshana Prajapat
Topic: Stationary isothermic surfaces in relation to geometry by

Speaker: Dr. T. Rajasekhar, IIT Kharagpur
Topic: Neumann Problem to Dirichlet Problem in Conservative Field by

Speaker: Prof. AK Pani, Math. Dept. IIT Bombay
Topic: Navier-Stokes Equations – a Million Dollar Problem

Speaker: Prof. Olivier Pironneau, Fellow of French Academy of Sciences, Universite de Paris VI and IUF
Topic: 1. Partial Differential Equations in Nuclear Waste Repository Assessment
2. Computation and Calibration of European and American Options

Speaker: Prof. K. W. Morton Former Professor, Oxford University
Topic: 1. Finite Volume Methods for Unsteady Hyperbolic Conservation Laws
2. Reactive Flow Problems Modelled by Box Scheme
3. Simplectic Properties of Familiar Difference Scheme

Speaker: Prof. AK Pani, Math. Dept. IIT Bombay
Topic: (6 lectures on) Adaptive Finite Element Methods for PDEs

Speaker: Dr. Soren Bartels, Humboldt University, Berlin
Topic: 1. Approximation of Harmonic Maps
2. Adaptive FEM for Heat Equations

Speaker: Prof. AK Pani, Math. Dept. IIT Bombay
Topic: 1. Adaptive FEM for Parabolic Equations
2. Mixed FEM for Incompressible Miscible Problems in Reservoir Studies

Speaker: Dr. Laurent Dumas, Univ. Paris-VI (France)
Topic: Global Optimization Methods and Applications in CFD

Speaker: Dr. Max Jensen, Humboldt University, Berlin
Topic: Discontinuous Galerkin Methods for Friedrichs Systems with Irregular Solutions

Speaker: Prof. G. S. Ladde, University of Texas at Arlington (USA)
Topic: Variational Comparision Theorem – Stochastic Approximations of Dynamic

SEMINARS UNDER SPECIAL YEAR ON *Number Theory* (NT05)

Speaker: Prof. Rob de Jeu, Durham University, U.K.
Topic: The Beilinson conjectures for K_2 of curves

Speaker: Prof. R. Schulze-Pillot, Universitat des Saarlaandes, Federal Republic of Germany
Topic: Sums of integral squares in number fields

Speaker: Prof. Robert P. Langlands, Institute for Advanced Study, Princetion, U.S.A.
Topic: An eigenvalue problem in the group algebra of the symmetric group.

Speaker: Prof. Laurent Clozel, Universite' de Paris-Sud, Orsay, France
Topic: Around the Andre'-Oort Conjecture

Speaker: Dr. M. Ram Murty, Queen's University, Kingston, Canada
Topic: Multiple Hurwitz Zeta Functions

Speaker: Dr. U. K. Anandavardhanan, Department of Mathematics, IIT Bombay
Topic: Derivatives of Representations

Speaker: Dr. U. K. Anandavardhanan, Dept. of Math., IIT Bombay
Topic: Representations of p-adic groups

Speaker: Prof. Dipendra Prasad, TIFR Mumbai
Topic: Derivatives of Representations

Speaker: Dr. Ravi Raghunathan, IIT Bombay
Topic: On the existence of cusp forms

Speaker: Dr. Jayanta Manoharmayum, Sheffield University, U.K.
Topic: Lifiting Galois representations

Speaker: Dr. Ravi Raghunathan, Department of Mathematics
Topic: 1. Unitary representations of locally compact groups
2. Unitary representations of locally compact groups
3. The Spectral theorem for normal operators on a Hilbert Space
4. The Spectral theorem for normal operators on a Hilbert Space

Speaker: Dr. Muthukrishnan Krishnamurthy
Topic: Base Change for Unitary Groups.