Annual Report for the year 1999-2000

The Department of Mathematics comprises of 26 faculty members with expertise in various areas of Mathematics, Statistics and Theoretical Computer Science. The faculty members strive to maintain quality teaching and research standards. During the academic year 1999-2000 two of the faculty members received awards for Distinguished and Outstanding Contributions to Mathematics Research and Teaching and Excellence in Teaching, respectively.

There is an active collaboration between the Department and various leading Institutes in India and abroad. The Department hosted an International Workshop, and Seminars were organized through the year. Moreover, the faculty members were involved in organizing Workshops, CEP Programmes, participation in national/international conferences, and writing books. They also carried out the honorary work like referee jobs for journals, reviewing projects, examining theses and serving on selection committees of other universities.

Academic Programmes

Besides the teaching of B.Tech. courses, the department offers M.Sc. and Ph.D. prgrammes along with its research activity. It has two distinct M.Sc. programmes. i) M.Sc. in Mathematics for those who intend to make research and/or teaching as their career. ii) M.Sc. in Applied Statistics and Informatics (ASI) who wish to take up professions which require various skills and techniques of Mathematics, Statistics and Informatics.

In addition, the department has a research programme leading to Ph.D. This programme has a broad based course work and specialization in many areas of Pure Mathematics, Applied Mathematics, Statistics and Scientific Computing.

Student intake

Ph.D. : 07

M.Sc. (Mathematics) : 18

M.Sc. (ASI) : 25

Degree Awarded

Ph.D. : 03

M.Sc. (Mathematics) : 13

M.Sc. (ASI) : 25

Extension Activities

The Mathematics Association of the Department organized the Popular Lecture series for the third year in succession.

The following lectures were held during the academic year 1999-2000.

1.S. Kumaresan, University of Mumbai,

Curvatures in Geometry

2.H. Narayanan, Department of Electrical Engineering, IIT Bombay,

Linear Algebra and Circuit Theory.

3.S.R. Ghorpade, Dept. of Mathematics, IIT Bombay,

Putting p on firm footing

4.Arvind Kumar, Director, Homi Bhabha Centre of Science Education, Mumbai,

Fractals in Nature

5.M. Sohoni, Department of Computer Science and Engg., IIT Bombay,

The Y2K Problem A Mathematical Insight

R & D Activities

The current research interest in the Department covers a wide range of fields:

Algebra, Combinatorics, Topology, Geometry, and Discrete Mathematics.

Real Analysis, Functional Analysis, Nonlinear Analysis, Ordinary and Partial Differential Equations and Control Theory.

Numerical Analysis and Scientific Computing.

Fluid Mechanics, Biomechanics, Magnetohydrodynamics, Tribology, Nonlinear Gasdynamics.

Statistical Inference, Reliability Theory, Biomolecular Statistics and Bioinformatics.

Mathematical Programming, Combinatorial Optimization, High Performance Computing, Parallel Algorithms, Computer Aided Geometric Designs.

More specifically, the faculty members are currently pursuing research in the following areas:

Algebraic varieties over finite fields, Linear error correcting codes, Invariant Theory, Grasmannians and Schubert varieties, Surfaces over C, Jacobian conjecture, Castelnuovo-Mumford regularity, fibre cones, local cohomology, Hilbert functions.

Vector-valued Mean periodic functions, Eigenvalue problems for large full matrices, Refinement and acceleration of approximate eigenvalues, eigenvectors and spectral subspaces of integral and differential operators, Stability and well-posedness of problems in Approximation and Optimization.

Application of Neural networks and genetic algorithms to industrial problems.

Parabolic Integro-Differential Equations, Mixed finite element methods, Orthogonal collocation and ADI, Variational inequalities, Asymptotic solutions of nonlinear hyperbolic systems and stability aspects, Formation of singularities in nonlinear partial differential equations.

Effects of magnetic field and body forces on blood flow and its rheology.

Stochastic complexity, Estimation after solution, Sampling inspection plan for dependent production processes, Reliability test plans, ANN for Molecular recognition, Nonparametric statistical and AI methods for protein engineering.

Applications of submodular functions to VLSI design and automation, Practical algorithms in computational geometry, Algorithms in CAGD.

Projects and Consultancies

Effect of Magnetic Field on Blood Flow with Blood as a Two Phase Magnetic Field, CSIR, Government of India.

Combinatorial and Computational Aspects of some Algebraic Varieties, AICTE, New Delhi.

Doing Industrial Mathematics via Genetic Algorithms, Differential Algebraic Equations, Online-Optimization, Computer Aided Geometric Design and Market Forecasting, DST, Government of India.

Neural Network Based AI Software Development for Epitope/Paratope Designing, Department of Biotechnology, Government of India.

Issues in Photomask Designs, DRD/MA/SBP-1/992-2000

Development of an Algorithms for Log-linear Models, Cytel India Ltd., Pune.

Development of an Algorithm for Logistic Models, Cytel India Ltd., Pune.

Estimation and Software Development of Single and Double Sampling Plans for Dependent Processes, CSIR, Government of India.

Sponsored Projects

Ongoing : 05

Sanctioned Outlay : 55 Lakhs

Faculty involved : 08

Consultancy

No. of jobs : 03

Income generated : 2.75 lakhs

Collaboration

There has been an active exchange between the Department and a number of leading institutes such as:

Colorado School of Mines (USA), University of Edinburgh (U.K.), University of Vienna (Austria), University of Osaka (Japan), UFPR, Custiba (Brazil), Institut de Mathematiques de Luminy (France), Univ. Jean Monnet (France), Univ. Joseph Fourier (France), TIFR (Mumbai), BARC (Mumbai), Bioinformatics Centre (Pune), Chennai Mathematical Institute, Matscience (Chennai), Rajasthan University, Jama Millia Islamia University (New Delhi).

Visitors

During the academic year 1999-2000 the following persons visited the department and gave seminar talks:

S.B. Hajra, National Aeronautical Lab. (Bangalore), E.R. Suryanarayan, Univ. of Rhode Island (USA), H.N. Mhaskar, California State University (USA), Arun Bagchi, Univ. of Twente (Netherlands), M.I. Beg, Univ. of Hyderbad, Anand Srivastav, University of Kiel (Germany), Uma Iyer, Mehta Research Institute (Allahabad), Timothy McCune, Mehta Research Institute (Allahabad).

Workshops

M.C. Joshi was convener for CEP Workshop on Engineering Optimization held during February 28-March 3, 2000. S.B. Patkar was one of the Resource Person in this Workshop.

M.C. Joshi also organized Study Group Meeting with NRB Bearings and a Study Group Meeting on Mathematical Modelling of Ecological Problems at MS University, Baroda.

I.K. Rana organized the DST sponsored 6^{th} Workshop in Mathematics in Dec.1999. The following were Resource Persons for this Workshop: A. Ranjan, S.V. Sabnis, I.K. Rana, V.D. Sharma, J. Prakash, M.A. Sohoni.

S.V. Sabnis was Course Co-ordinator of a 3-day Workshop on Mathematical/ Statistical Software Packages for Data Analysis, Modelling and Simulation, IIT Bombay, 22-24 April 1999.

J.K. Verma organized International Workshop Invariant Theory held at Pune Univ. during Dec. 29, 1999- Jan.4, 2000 and Winter School "Algorithm in Invariant Theory held at Pune Univ. during Dec. 8 Dec. 28, 1999.

J.K. Verma and D.V. Pai completed a CDP project, Preparation of Lecture Notes and Transparencies for Mathematics II.

Awards and Honours

V.D. Sharma received C.L. Chandna 1999 Mathematics Award for Distinguished and Outstanding Contributions to Mathematics Research and Teaching.

B.V. Limaye received the Best Teacher Award from IIT Bombay for Excellence in Teaching.

A.K. Pani was invited to join the Editorial Board of International Journal Differential Equations and Dynamical Systems. He also delivered Bamacharan Das Memorial Lecture in the National Conference on Recent Trends in Mathematics and Computing, held during 11-12 March 2000, at Utkal University, Orissa.

A.R. Shastri chaired technical session in the International Workshop Trends in Commutative Algebra held at IIT Bombay, during 13-15th Jan 2000.

S.R. Ghorpade was nominated as Member of Managing Committee, Bombay Mathematical Colloquium and as Member of Review Committee for Syllabi of B.A./B.Sc. Programme in Mathematics, University of Mumbai, 1999-2000.

J.K. Verma was appointed the Convener of "Nurture Programme in Mathematics" for the years 2000 and 2001 to be held at TIFR, Bombay.

Books / Chapters in Book

Shastri, A.R.

An Introduction to Complex Analysis,

Macmilla India Ltd., 1999.

Subramanyam A. (with Pandalai, H.S.)

Models and Techniques in Ore Resource Estimation, Data Analysis in Geology (Editors: HS. Pandalai and P.K. Saraswati), Hindustan Publishers, New Delhi.

Papers in Proceedings

International

Chaturani P.

1. Current tends in pulsatile flow of blood with periodic body forces.
2. Mathematical modelling of Yogasana and other exercises.

   Proceedings of International Conference in Biomechanics Supplemented with Yoga Concepts, Bangalore (1999), pp. 91-107 and pp. 165-179.

Ghorpade S.R. (with G. Lachaud),

1.Higher weights of Grassmann codes, Coding Theory, Cryptography and Related Areas (Eds. J. Buchmann, T. Hoeholdt, H. Stichtenoth and H. Topia Recillas), Springer-Verlag, Berlin (Heidelberg), (1999), pp. 122-131.

2. On the enumeration of indexed monomials and the computation of Hilbert functions of ladder determinantal varieties, Formal Power Series and Algebraic Combinatorics, Acts/Proceedings (Eds. C. Martinez, N. Noy and O. Serra), UPC, Barcelona (1999), pp. 225-232.

Joshi, R.R. (with Jyothi S.)

Presented

A new computational method for protein structure predictions: Native distance estimation through nonparametric regression,

International Symposium on Recent Trends in Biomed. Res., TIFR, Mumbai, Sept.1999.

Pai, D.V. (with Indira K.)

On well-posed, well-set and conditioned problems in approximation, Proceedings of the International Conference on Mathematical Modelling of Non-linear Systems, IIT Kharagpur (1999), 175-190.

Patkar S.B. (with R. Venugopal, S.S.S.P. Rao)

1. Parallel I/O : Modelling and Scheduling Policies, TENCON99, Korea (1999)
2. Priority scheduling in parallel I/O systems, PDPTA99, Las Vegas-USA (1999).

National

Sabnis S.V. (with H. Nair)

Reliability test plans for series systems with discrete data, Proceedings of National Seminar on Reliability Analysis and Engineering, Vikram Sarabhai Space Centre, Trivandrum, December 1999, page 142-147.

Papers in Journals

International

Joshi, R.R. Adaptive development of antibody repertoire under structural matching and system constraint, Journal of Biological Systems, Vol. 7(1) (1999) pp. 53-65.

Prakash J. (with Gururajan K.)

Effect of velocity slip in an infinitely long rough porous journals bearing, Tribology Transactions, Vol. 42, (1999) pp. 661-667

S.V. Sabnis (with M.N. Balu), Preservation of unimodality under univariate shock models, Naval Research Logistics, Vol. 46 (1999), 952-957.

V.D. Sharma (with J. Jena), Backlund transformations for linear equations with variable coefficients, IL NUOVO CIMENTO (Italy), 114B (1999), 1003-1016.

Presentation / Participation in Conferences/Workshops

Chaturani P.

1. Current trends in pulsatile flow of blood with periodic body forces.

2. Mathematical modelling of yogasana and other exercises.

   International Conference in Biomechanics supplemented with yoga concepts, UGC-DSA Center in Fluid Mechanics, University of Bangalore, Dec. 12-15, 1999.

Ghorpade S.R.

Participated in

1. International Colloquium on Algebra, Arithmetic and Geometry, TIFR Mumbai, Jan. 2000.
2. International Workshop on Trends in Commutative Algebra, IIT Bombay, Jan. 2000.

Presented papers entitled

1. Hilbert functions of ladder deteriminantal ideals, in 11^{th} International Conference on Formal Power Series and Algebraic Combinatorics, Universitat Politechnica de Catalunga, Barcelonia, Spain, June 1999.
2. Hilbert polynomial of ladder determinantal varieties in International Conference on Commutative Algebra and Algebraic Geometry, University of Messina, Sicily, Italy, June 1999.

Limaye B.V.

1. Accelerated refinement of approximate eigenelements of integral operators.
2. Improvement of accuracy of approximate eigenelemts of integral operators

   ICIAM 99, 5^{th}-9^{th} July 1999.

Kulkarni R.P.

was invited to participate in the fourth International Conference on Curves and Surfaces held at Saint-Malo, France during 1st 7th July 1999.

Pai D.V. gave a Key-note Address:

On Well-posed, Well-set and Conditional Problems in Approximation, ICOMMONS 99, IIT Kharagpur, 1999.

S.V. Sabnis

Participated in a Workshop on "Modelling Real Systems: A Hands-On First Encounter with Industrial Mathematics" held at the ICTP, Trieste, Italy, from 27th Sept. 22nd October, 1999.

V.D. Sharma

Delivered a lecture at the International Conference of the Academy of Physical Sciences held at the University of Allahabad, Dec. 1999.

A.R. Shastri

was invited to participate in the International Colloquium on Algebra, Arithmetic and Geometry held at TIFR, Mumbai, Jan. 2000.

He also gave 10 lectures in the International Workshop on "Algorithms in invariant Theory and Algebraic Geometry during Dec. 8 to Jan. 4, 2000

P. Vellaisamy

Participated in the International Conference on Statistics, Combinatorics and Related Areas held at Mobile, Alabama, U.S.A. during 18th 20th Dec. 1999.

J.K. Verma (with A.V. Jayanthan)

Hilbert functions of bigraded algebras local cohomology and mixed multiplicities, The International Workshop on Trends in Commutative Algebra, IIT Bombay, 13th-15thJan. 2000.

He was invited to participate in the International Colloquium in Algebra and Geometry held at TIFR, Bombay, Jan. 2000.

National

Ghorpade S.R.

Participated in

Winter School on Algorithms in Invariant theory and Algebraic Geometry, University of Pune, Dec. 1999.

and presented paper entitled

Codes associated to Grassmannians and Schubert Varieits in Seminaire Arithmetique et Theoryie de la Information, Institut de Mathematiques de Luminy, Morseille, France, June 1999.

Resource Person in

UGC Refresher course on Fundamental Theorem of Algebra, University of Mumbai, Feb. 2000.

Pani A.K.

Bamacharan Das Memorial Lecture

Industrial Mathematics: Key to Key Technologies and Its Impact on Research and Education in Mathematics National Conference on Recent Trends in Mathematics and Computing, March 200, Utkal University, Bhubaneswar.

Rana I.K.

On Convolution Equations, 7the Harmonic Analysis Discussion Meeting, IIT Kanpur, Jan 2000.

Sabnis S.V. (with H. Nair)

Reliability test plans for series systems with discrete data, National Seminar on Reliability Analysis and Engineering, Vikram Sarabhai Space Centre, Trivandrum, December 1999.

V.D. Sharma (with J. Jena)

Group-theoretic solutions of a bore on a sloping beach, 44^{th} Congress of the Indian Society of Theoretical and Applied Mechanics, REC, Warangal, Dec. 1999.

A.R. Shastri gave seven lectures on Poincare-Hurwitzs formula in the NBHM Sponsored Workshop Complex Dynamics held at University of Mumbai during 10-28 June 1999.

G.K. Srinivasan gave lectures on Invariant theory of binary forms in the Winter School Algorithms in Invariant Theory and Computational Algebraic Geometry held at University of Pune during Dec. 1999.

Verma J.K.

Participated in

National meeting of Mathematics Educators, Homi Bhabha Center of Science Education, Mumbai, Jan. 8, 2000.

He delivered

10 lectures in Winter School Algorithms in Invariant Theory and Algebraic Geometry, Pune University, Dec. 1999.

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Seminars/Colloquium/Invited Lectures:

Ghorpade S.R.

Discriminants in Algebra and Arithmetic, S.P. College, Pune, Feb. 2000.

Joshi R.R.

Invited Seminar and Lecture Series

a. Advanced Biostatistics and Computational Biology, Research Centre at ASTRA Biochemicals, Bangalore, May 1999.
b. Neural Computing, Bioinformatics Centre, Pune, Feb. 2000.

Limaye B.V.

Some Problems about Prime Numbers, S.P. College, Pune

Pani A.K.

Opportunities in Mathematics at IIT Bombay, Utkal University, Bhubaneswar.

Sabnis, S.V.

Applications of Statistics, K.J. Somaiya College, Mumbai, August 1999.

J.K. Verma

a. 3 lectures in UGC refresher course Fundamental Theorem of Algebra, Feb. 2000
b. 24 lectures on Factorization in MTTS Programme, Mysore, May-June 1999.
c. 15 lectures on Galois Theory in the NBHM Nurture Progamme, TIFR, Bombay, June 1999.

Honorary Work

Ghorpade S.R.

Reference work for IEEE Transactions of Information Theory, Member, Project Advisory Committee, DST Project.

Joshi M.C.

Review of

(a) papers in national and international journals.

a. Ph.D. thesis form I.I.Sc. Bangalore, Roorkee University
b. DST Projects

Joshi R.R.

Referee work for Computers and O.R., Neural Processing Letters

Review of Dept. of Biotechnology, New Delhi project.

Limaye B.V.

Referee work for Proceedings (Math-Sci.), Indian Academy of Sciences

Review of DST Project.

Pai, D.V.

Member, Editorial Board, Proceedings ATA 99

Referee work for Proceedings (Math. Sci.), Indian Academy of Sciences.

Review of DST & Council of Science and Technology (U.P.) Projects.

Examiner of Ph.D. Thesis, IIT Kanpur.

Pani A.K.

Referee work for SIAM J. Numerical Analysis, J. Math. Anal. And Appl., Numer.Math., PDE, Differential Equations and Dynamical Systems.

Examiner: Ph.D. Theses from Inst. Math. Sciences, Chennai and Berhampur University.

Sabnis S.V.

Referee work for J. of Statistical Planning and Inference.

Sharma V.D.

Review and Referee work for Mathematical Reviews (U.S.A.), Physics of Fluids (U.S.A.)

Examiner: Ph.D. Thesis from B.H.U.

Shastri A.R. Evaluated one application for NBHM Post Doctoral Award.

Examiner : Ph.D. Thesis

Subramanyam A.

Referee work for journals

Vellaisamy P.

Referee work for OPSEARCH, Journal of Indian Statistical Association.

Verma, J.K.

Referee work for Communications in Algebra, Proceedings of Cambridge Philosophical Society, Indian Journal of Pure and Applied Mathematics.

He also wrote 8 Mathematical Reviews.

Faculty & Their Specialisations

1.P. Chaturani

Fluid Mechanics, Biomechanics, Magnetohydrodynamics, Magnetic Fluids.

2.S.R. Ghorpade

Algebraic Geometry, Combinatorics, Coding Theory, Number Theory.

3.K.D. Joshi

Topology, Discrete Mathematics

4.M.C. Joshi

Control Theory, Nonlinear Analysis

5.R.R. Joshi

Theoretical and Computational Biology, Biomolecular Statistics and Bioinformatics.

6.S. Krishnamoorthy

Statistics, Operations Research (Decision Support System), Marketing Research, Product Innovation and Diffusion Process.

7.R. P. Kulkarni

Numerical Functional Analysis, Spline Theory, Computer Aided Geometric Designs.

8.B.V. Limaye

Functional Analysis, Numerical Analysis, Spectral Approximation

9.D.V. Pai

Functional Analysis, Optimization and Approximation, Set-valued Analysis.

10.A.K. Pani

Partial Differential Equations, Numerical Analysis, and Scientific Computing.

11.K.S. Parihar

Mechanics of Solids

12.S.B. Patkar

Mathematical Programming, Combinatorial Optimization

13.Prem Narain

Numerical Analysis

14.J. Prakash

Tribology

15.I.K. Rana

Real Analysis

16.A. Ranjan

Differential Geometry, Topology

17.S.V. Sabnis

Reliability Theory

18.V.D. Sharma

Quasilinear System of PDEs, Nonlinear Gasdynamics

19. A.R. Shastri

Algebraic Geometry, Algebraic Topology

20. N. Sivaramakrishnan

Complex Analysis

21. A. Srinivasan

High Performance Computing, Scientific Software, Parallel Algorithms.

22. G.K. Srinivasan

Ordinary and Partial Differential Equations

23. M.K. Srinivasan

Combinatorics, Operations Research

24. A. Subramanyam

Statistical Inference, Geostatistics

25.P. Vellaisamy

Statistical Inference

26.J.K. Verma

Commutative Algebra