

## IMA SUMMER PROGRAMS

- 1987 Robotics
- 1988 Signal Processing
- 1989 Robustness, Diagnostics, Computing and Graphics in Statistics
- 1990 Radar and Sonar (June 18 - June 29)  
New Directions in Time Series Analysis (July 2 - July 27)
- 1991 Semiconductors
- 1992 Environmental Studies: Mathematical, Computational, and  
Statistical Analysis
- 1993 Modeling, Mesh Generation, and Adaptive Numerical Methods  
for Partial Differential Equations
- 1994 Molecular Biology
- 1995 Large Scale Optimizations with Applications to Inverse Problems,  
Optimal Control and Design, and Molecular and Structural  
Optimization
- 1996 Emerging Applications of Number Theory
- 1997 Statistics in Health Sciences

### SPRINGER LECTURE NOTES FROM THE IMA:

#### *The Mathematics and Physics of Disordered Media*

Editors: Barry Hughes and Barry Ninham  
(Lecture Notes in Math., Volume 1035, 1983)

#### *Orienting Polymers*

Editor: J.L. Ericksen  
(Lecture Notes in Math., Volume 1063, 1984)

#### *New Perspectives in Thermodynamics*

Editor: James Serrin  
(Springer-Verlag, 1986)

#### *Models of Economic Dynamics*

Editor: Hugo Sonnenschein  
(Lecture Notes in Econ., Volume 264, 1986)

## The IMA Volumes in Mathematics and its Applications

---

### *Current Volumes:*

- 1     **Homogenization and Effective Moduli of Materials and Media**  
J. Ericksen, D. Kinderlehrer, R. Kohn, and J.-L. Lions (eds.)
- 2     **Oscillation Theory, Computation, and Methods of Compensated Compactness** C. Dafermos, J. Ericksen, D. Kinderlehrer, and M. Slemrod (eds.)
- 3     **Metastability and Incompletely Posed Problems**  
S. Antman, J. Ericksen, D. Kinderlehrer, and I. Muller (eds.)
- 4     **Dynamical Problems in Continuum Physics**  
J. Bona, C. Dafermos, J. Ericksen, and D. Kinderlehrer (eds.)
- 5     **Theory and Applications of Liquid Crystals**  
J. Ericksen and D. Kinderlehrer (eds.)
- 6     **Amorphous Polymers and Non-Newtonian Fluids**  
C. Dafermos, J. Ericksen, and D. Kinderlehrer (eds.)
- 7     **Random Media** G. Papanicolaou (ed.)
- 8     **Percolation Theory and Ergodic Theory of Infinite Particle Systems** H. Kesten (ed.)
- 9     **Hydrodynamic Behavior and Interacting Particle Systems**  
G. Papanicolaou (ed.)
- 10    **Stochastic Differential Systems, Stochastic Control Theory, and Applications** W. Fleming and P.-L. Lions (eds.)
- 11    **Numerical Simulation in Oil Recovery** M.F. Wheeler (ed.)
- 12    **Computational Fluid Dynamics and Reacting Gas Flows**  
B. Engquist, M. Luskin, and A. Majda (eds.)
- 13    **Numerical Algorithms for Parallel Computer Architectures**  
M.H. Schultz (ed.)
- 14    **Mathematical Aspects of Scientific Software** J.R. Rice (ed.)
- 15    **Mathematical Frontiers in Computational Chemical Physics**  
D. Truhlar (ed.)
- 16    **Mathematics in Industrial Problems** A. Friedman
- 17    **Applications of Combinatorics and Graph Theory to the Biological and Social Sciences** F. Roberts (ed.)
- 18     **$q$ -Series and Partitions** D. Stanton (ed.)
- 19    **Invariant Theory and Tableaux** D. Stanton (ed.)
- 20    **Coding Theory and Design Theory Part I: Coding Theory**  
D. Ray-Chaudhuri (ed.)
- 21    **Coding Theory and Design Theory Part II: Design Theory**  
D. Ray-Chaudhuri (ed.)
- 22    **Signal Processing Part I: Signal Processing Theory**  
L. Auslander, F.A. Grünbaum, J.W. Helton, T. Kailath, P. Khargonekar, and S. Mitter (eds.)

- 23 **Signal Processing Part II: Control Theory and Applications  
of Signal Processing** L. Auslander, F.A. Grünbaum, J.W. Helton,  
T. Kailath, P. Khargonekar, and S. Mitter (eds.)
- 24 **Mathematics in Industrial Problems, Part 2** A. Friedman
- 25 **Solitons in Physics, Mathematics, and Nonlinear Optics**  
P.J. Olver and D.H. Sattinger (eds.)
- 26 **Two Phase Flows and Waves**  
D.D. Joseph and D.G. Schaeffer (eds.)
- 27 **Nonlinear Evolution Equations that Change Type**  
B.L. Keyfitz and M. Shearer (eds.)
- 28 **Computer Aided Proofs in Analysis**  
K. Meyer and D. Schmidt (eds.)
- 29 **Multidimensional Hyperbolic Problems and Computations**  
A. Majda and J. Glimm (eds.)
- 30 **Microlocal Analysis and Nonlinear Waves**  
M. Beals, R. Melrose, and J. Rauch (eds.)
- 31 **Mathematics in Industrial Problems, Part 3** A. Friedman
- 32 **Radar and Sonar, Part I**  
R. Blahut, W. Miller, Jr., and C. Wilcox
- 33 **Directions in Robust Statistics and Diagnostics: Part I**  
W.A. Stahel and S. Weisberg (eds.)
- 34 **Directions in Robust Statistics and Diagnostics: Part II**  
W.A. Stahel and S. Weisberg (eds.)
- 35 **Dynamical Issues in Combustion Theory**  
P. Fife, A. Liñán, and F.A. Williams (eds.)
- 36 **Computing and Graphics in Statistics**  
A. Buja and P. Tukey (eds.)
- 37 **Patterns and Dynamics in Reactive Media**  
H. Swinney, G. Aris, and D. Aronson (eds.)
- 38 **Mathematics in Industrial Problems, Part 4** A. Friedman
- 39 **Radar and Sonar, Part II**  
F.A. Grünbaum, M. Bernfeld, and R.E. Blahut (eds.)
- 40 **Nonlinear Phenomena in Atmospheric and Oceanic Sciences**  
G.F. Carnevale and R.T. Pierrehumbert (eds.)
- 41 **Chaotic Processes in the Geological Sciences** D.A. Yuen (ed.)
- 42 **Partial Differential Equations with Minimal Smoothness  
and Applications** B. Dahlberg, E. Fabes, R. Fefferman, D. Jerison,  
C. Kenig, and J. Pipher (eds.)
- 43 **On the Evolution of Phase Boundaries**  
M.E. Gurtin and G.B. McFadden
- 44 **Twist Mappings and Their Applications**  
R. McGehee and K.R. Meyer (eds.)
- 45 **New Directions in Time Series Analysis, Part I**  
D. Brillinger, P. Caines, J. Geweke, E. Parzen, M. Rosenblatt,  
and M.S. Taqqu (eds.)

- 46 **New Directions in Time Series Analysis, Part II**  
D. Brillinger, P. Caines, J. Geweke, E. Parzen, M. Rosenblatt,  
and M.S. Taqqu (eds.)
- 47 **Degenerate Diffusions**  
W.-M. Ni, L.A. Peletier, and J.-L. Vazquez (eds.)
- 48 **Linear Algebra, Markov Chains, and Queueing Models**  
C.D. Meyer and R.J. Plemmons (eds.)
- 49 **Mathematics in Industrial Problems, Part 5** A. Friedman  
50 **Combinatorial and Graph-Theoretic Problems in Linear Algebra**  
R.A. Brualdi, S. Friedland, and V. Klee (eds.)
- 51 **Statistical Thermodynamics and Differential Geometry  
of Microstructured Materials**  
H.T. Davis and J.C.C. Nitsche (eds.)
- 52 **Shock Induced Transitions and Phase Structures in General  
Media** J.E. Dunn, R. Fosdick, and M. Slemrod (eds.)
- 53 **Variational and Free Boundary Problems**  
A. Friedman and J. Spruck (eds.)
- 54 **Microstructure and Phase Transitions**  
D. Kinderlehrer, R. James, M. Luskin, and J.L. Ericksen (eds.)
- 55 **Turbulence in Fluid Flows: A Dynamical Systems Approach**  
G.R. Sell, C. Foias, and R. Temam (eds.)
- 56 **Graph Theory and Sparse Matrix Computation**  
A. George, J.R. Gilbert, and J.W.H. Liu (eds.)
- 57 **Mathematics in Industrial Problems, Part 6** A. Friedman  
58 **Semiconductors, Part I**  
W.M. Coughran, Jr., J. Cole, P. Lloyd, and J. White (eds.)
- 59 **Semiconductors, Part II**  
W.M. Coughran, Jr., J. Cole, P. Lloyd, and J. White (eds.)
- 60 **Recent Advances in Iterative Methods**  
G. Golub, A. Greenbaum, and M. Luskin (eds.)
- 61 **Free Boundaries in Viscous Flows**  
R.A. Brown and S.H. Davis (eds.)
- 62 **Linear Algebra for Control Theory**  
P. Van Dooren and B. Wyman (eds.)
- 63 **Hamiltonian Dynamical Systems: History, Theory,  
and Applications**  
H.S. Dumas, K.R. Meyer, and D.S. Schmidt (eds.)
- 64 **Systems and Control Theory for Power Systems**  
J.H. Chow, P.V. Kokotovic, R.J. Thomas (eds.)
- 65 **Mathematical Finance**  
M.H.A. Davis, D. Duffie, W.H. Fleming, and S.E. Shreve (eds.)
- 66 **Robust Control Theory** B.A. Francis and P.P. Khargonekar (eds.)
- 67 **Mathematics in Industrial Problems, Part 7** A. Friedman  
68 **Flow Control** M.D. Gunzburger (ed.)

- 69 **Linear Algebra for Signal Processing**  
A. Bojanczyk and G. Cybenko (eds.)
- 70 **Control and Optimal Design of Distributed Parameter Systems**  
J.E. Lagnese, D.L. Russell, and L.W. White (eds.)
- 71 **Stochastic Networks** F.P. Kelly and R.J. Williams (eds.)
- 72 **Discrete Probability and Algorithms**  
D. Aldous, P. Diaconis, J. Spencer, and J.M. Steele (eds.)
- 73 **Discrete Event Systems, Manufacturing Systems,  
and Communication Networks**  
P.R. Kumar and P.P. Varaiya (eds.)
- 74 **Adaptive Control, Filtering, and Signal Processing**  
K.J. Åström, G.C. Goodwin, and P.R. Kumar (eds.)
- 75 **Modeling, Mesh Generation, and Adaptive Numerical Methods  
for Partial Differential Equations** I. Babuska, J.E. Flaherty,  
W.D. Henshaw, J.E. Hopcroft, J.E. Oliger, and T. Tezduyar (eds.)
- 76 **Random Discrete Structures** D. Aldous and R. Pemantle (eds.)
- 77 **Nonlinear Stochastic PDEs: Hydrodynamic Limit and Burgers'  
Turbulence** T. Funaki and W.A. Woyczynski (eds.)
- 78 **Nonsmooth Analysis and Geometric Methods in Deterministic  
Optimal Control** B.S. Mordukhovich and H.J. Sussmann (eds.)
- 79 **Environmental Studies: Mathematical, Computational,  
and Statistical Analysis** M.F. Wheeler (ed.)
- 80 **Image Models (and their Speech Model Cousins)**  
S.E. Levinson and L. Shepp (eds.)
- 81 **Genetic Mapping and DNA Sequencing**  
T. Speed and M.S. Waterman (eds.)
- 82 **Mathematical Approaches to Biomolecular Structure and Dynamics**  
J.P. Mesirov, K. Schulten, and D. Sumners (eds.)

## ***FORTHCOMING VOLUMES***

1993-1994: *Emerging Applications of Probability*

Mathematical Population Genetics  
Stochastic Models in Geosystems  
Classical and Modern Branching Processes

1994-1995: *Waves and Scattering*

Computational Wave Propagation  
Wavelet, Multigrid and Other Fast Algorithms (Multiple, FFT)  
and Their Use in Wave Propagation  
Waves in Random and Other Complex Media  
Inverse Problems in Wave Propagation  
Singularities and Oscillations  
Quasiclassical Methods  
Multiparticle Quantum Scattering with Applications to  
Nuclear, Atomic, and Molecular Physics

1995 Summer Program: *Large Scale Optimization with Applications to  
Inverse Problems, Optimal Control and Design, and Molecular and  
Structural Optimization*

1995-1996: *Mathematical Methods in Materials Science*

Mechanical Response of Materials from Angstroms to Meters  
Phase Transformations, Composite Materials, and Microstructure  
Disordered Materials  
Particulate Flows: Processing and Rheology  
Interface and Thin Films  
Nonlinear Optical Materials  
Numerical Methods for Polymeric Systems  
Topology and Geometry in Polymer Science  
Mathematics in Industrial Problems, Part 9