

New England Complex Systems Institute:  
Education and Fellowship Opportunities

- NECSI Winter School - Jan 5-23, 2009
- <http://www.necsi.edu/events/winter2009.html>
  
- NECSI Faculty Fellows Program
- <http://necsi.edu/education/eff.html>
  
- NECSI Postdoctoral and Student Fellows Program
- <http://necsi.edu/education/epsf.html>

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NECSI Winter School

Jan 5-9, 2009 / Complex Physical, Biological & Social Systems  
Jan 12-16, 2009 / Complex Systems Modeling and Networks  
Jan 19-23, 2009 / Methods for the Study of Complex Systems

TARGET AUDIENCE

These courses are intended for faculty, graduate students, post-doctoral fellows and others who would like to gain an understanding of the fundamentals of complex systems, and develop methodological tools for conducting research in their respective fields.

Each week is the equivalent of a one semester course in a one week format. They may be taken independently or consecutively. If desired, arrangements for credit at a home institution should be made in advance.

WEEK ONE

CX201: Complex Physical, Biological and Social Systems

Dates: January 5-9, 2009

Location: MIT, Cambridge, MA

This course offers an introduction to the essential concepts of complex systems and related mathematical methods and simulation strategies with application to physical, biological and social systems. The course will particularly focus on the use of multiscale representations as a unifying approach to complex systems concepts, methods and applications.

Concepts to be discussed include: emergence, complexity, networks, self-organization, pattern formation, evolution, adaptation, fractals, chaos, cooperation, competition, attractors, interdependence, scaling, dynamic response, information, and function.

Methods to be discussed include: statistical methods, cellular automata, agent-based modeling, pattern recognition, system representation and informatics.

## WEEK TWO

### CX202: Complex Systems Modeling and Networks

Dates: January 12-16, 2009

Location: MIT, Cambridge, MA

This course provides an introduction to building models of complex systems (physical, biological, social and engineering), and network architectures dynamic processes.

It will cover the basic construction and analysis of models including identifying what is to be modeled, constructing a mathematical representation, analysis tools and implementing and simulating the model in a computer simulation. Particular attention will be paid to choosing the right level of detail for the model, testing its robustness, and discussing which questions a given model can or cannot answer.

The study of networks will introduce the use of network topologies and the characterization of networks describing complex systems, including such concepts as small worlds, degree distribution, diameter, clustering coefficient, modules, motifs. Different types of network topologies and network behaviors that model aspects of real complex systems will be described including: modular, sparse, random, scale-free, influence, transport, transformation, and structure.

## WEEK THREE

### CX203: Methods for the Study of Complex Systems

Dates: January 19-23, 2009

Location: MIT, Cambridge, MA

This course provides an introduction to mathematical tools for analysis of complex systems.

It will cover the basic construction and analysis of models including iterative maps, stochastic processes, markov chains, cellular automata, stochastic fields, Monte Carlo simulations, information theory, computation theory, scaling, fractals and renormalization, linear stability analysis, pattern formation, and mean field theory.

This course is designed to provide a foundation for mathematical analysis of a variety of models of complex systems, as a foundation for advances that are not possible with conventional

calculus and statistics.

An advanced mathematical background corresponding to a junior or senior college level background in mathematics or physics is recommended for this week three course.

For more information and registration:

<http://www.necsi.edu/events/winter2009.html>

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NECSI Faculty Fellows Program

We are pleased to announce the NECSI Faculty Fellows Program enabling outstanding faculty to join in NECSI complex systems research and application activities across disciplines and social concerns. NECSI Fellows can also participate in learning or teaching in educational programs.

The goal of this program is to dramatically advance complex systems research and the contributions of Fellows and dissemination of results through publications.

NECSI Fellows remain in residence at their home institutions and receive financial support for travel to NECSI to participate in special programs and research. Collaborations continue year round. Fellows are appointed for a three to five year term.

For more information and application see:

<http://necsi.edu/education/eff.html>

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NECSI Postdoctoral and Student Fellows Program

Postdoctoral and graduate students (with the approval of supervisors at their home institutions) may apply for the NECSI Fellows Program, an opportunity to join in complex systems research activities and publications working directly with NECSI researchers.

NECSI accepts applications from outstanding students across academic disciplines who are interested in contributing to the advancement of complex systems science and its application to professional contexts and social concerns.

Applicants must:

- Have demonstrated outstanding intellectual capabilities.
- Be driven by a desire to contribute and a concern for the improvement of society.
- Have a demonstrated ability to converse and write effectively.

NECSI Fellows remain in residence at their home institutions and receive financial support for travel to NECSI to participate

in special programs and research. Collaborations continue year round. Fellows are appointed for a three to five year term.

For more information:

<http://necsi.edu/education/epsf.html>

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[complex-announcements@necsi.org](mailto:complex-announcements@necsi.org)

If you prefer not to receive messages about this and future programs please let us know by sending an email to [complex-announcements-off@necsi.org](mailto:complex-announcements-off@necsi.org).

If this does not work send an e-mail to:

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