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Department of  
**Computer Science**

Courses of Study:  
Minor  
Major (BA/BS)  
Postbaccalaureate Certificate (PB)  
Combined BA/MA  
Combined PB/MA  
Master of Arts  
Doctor of Philosophy

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## Objectives

### Undergraduate Major and Minor

The undergraduate program in computer science teaches the theoretical fundamentals and practical aspects of computing, preparing students for creative jobs in the computer industry and/or for graduate school. In addition, our curriculum is a stimulating and useful preparation for a number of indirectly related professions, such as law, medicine, and economics.

### Postbaccalaureate Program in Computer Science

The computer science department offers a postbaccalaureate certificate program for students with a bachelor's degree in a different field who wish to prepare for graduate school or a career in computer science. Students who complete the program may apply to the combined postbaccalaureate/MA program.

### Graduate Program in Computer Science

The graduate program in computer science is concerned with the fundamental concepts arising in the development and use of computing systems, including the study of computational complexity and information theory, the design and analysis of serial and parallel algorithms, the design of programming languages, systems, and artificial intelligence.

A normal program of study in computer science at Brandeis starts with two years of basic graduate coursework. At the completion of this course work, students are eligible for a master's degree. During this initial two-year period, candidates for the degree of Doctor of Philosophy select a thesis topic and adviser. Dissertation research typically requires two to three additional years.

### Graduate Program in Computational Linguistics

The graduate program in computational linguistics is concerned with the scientific study of language from a computational perspective. It is an interdisciplinary field, which draws on linguistic theory (phonology, syntax, semantics, and pragmatics) and computer science (artificial intelligence, theory of computation, and programming methods).

## How to Become a Major or a Minor

Previous experience in computer programming is helpful, but not necessary. Students lacking such knowledge may take COSI 11a (Programming in Java and C) in their first year. As a rule, the computer science course sequence should not be started later than the sophomore year.

## How to Be Admitted to the Graduate Program

The general requirements for admission to the Graduate School, given in an earlier section of the *Bulletin*, apply here. Applicants for admission to the computer science program must submit three letters of recommendation and are encouraged to take the Graduate Record Examination and the advanced test in computer science. Funds from research grants and fellowships are available to provide financial support for well-qualified students.

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## Faculty

### Timothy Hickey, Chair and Undergraduate Advising Head

Analysis of algorithms. Logic programming and parallel processing. Symbolic manipulation. Groupware.

### Richard Alterman

Artificial intelligence. Cognitive modeling. Natural language processing. Memory-based reasoning and everyday activity.

### Mitch Cherniack

Databases. Software engineering. Programming languages.

### Jacques Cohen (on leave 2008–2009)

Compiler design. Analysis of parallel algorithms. Logic programming. Data structures. Bioinformatics.

### Ira Gessel

Combinatorics.

### Pengyu Hong (on leave 2008–2009)

Computational biology. Image processing. Statistical machine learning.

### Harry Mairson

Logic in computer science. Lambda calculus and functional programming. Type theory and constructive mathematics. Complexity theory. Algorithmics.

### Olga Papaemmanouil

Databases and application-level networking.

### Jordan Pollack

Artificial intelligence. Neural networks. Machine learning. Evolutionary computation. Dynamical systems.

### James Pustejovsky, Graduate Advising Head

Artificial intelligence. Computational linguistics. Machine learning.

### Liuba Shrira

Operating systems. Distributed systems. Multi-cache computing.

### James Storer

Data compression and image processing. Computational geometry. Parallel computing. Algorithms.

### Nianwen Xue

Linguistic structures. Language processing. Natural computational linguistics.

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## Requirements for the Minor

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**A.** COSI 21a and 22a.

**B.** Five additional computer science courses, one of which may be a cross-listed course or another course approved by the undergraduate advising head.

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## Requirements for the Major

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### Degree of Bachelor of Arts

The minimum requirements for the computer science major are twelve full courses plus two half-credit lab courses:

**A.** Core courses: COSI 21a and 22a, 21b and 22b, 29a, 30a, 31a, and 101a.

**B.** Mathematics courses: MATH 10a, 15a.

**C.** Electives: At least four additional COSI courses, excluding 2a, 11a, and 99d. At most, two electives can be cross-listed courses.

### Degree of Bachelor of Science

The minimum requirement for the computer science major are seventeen full courses and two half-credit lab courses:

**A.** Core courses: COSI 21a and 22a, 21b and 22b, 29a, 30a, 31a, and 101a.

**B.** Mathematics courses: MATH 10a, 10b, and 15a.

**C.** Two cross-listed courses from other departments (students should consult the individual course entries for prerequisites, corequisites, and special notes).

**D.** Electives: At least six additional COSI courses, excluding COSI 2a, 11a, and 99d. At most, two of these can be cross-listed courses.

### Honors

Graduation with honors in computer science requires completion and defense of a senior honors thesis; students considering this option should take note of the prerequisites for enrollment in COSI 99d (Senior Research).

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## Combined BA/MA Program in Computer Science

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Available only to Brandeis students who have completed all requirements for the undergraduate BA degree and have performed well in the computer science major. Students should apply in their senior year, at which time they should propose a course of study for the fifth year that typically consists of six graduate-level courses, which may include independent study.

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## Combined BA/MA Program in Computational Linguistics

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The five-year BA/MA degree program in computational linguistics is designed for outstanding undergraduate students who will have completed all requirements for the undergraduate BA degree within four years at Brandeis, with a major preferably in either language and linguistics or computer science. Eligibility for the program is normally limited to students who have maintained a minimum 3.5 GPA in all linguistics and computer science courses taken. Students complete the MA in computational linguistics by taking computational linguistics courses in the senior (fourth) year and in one additional (fifth)

year of study. The MA degree provides a solid foundation for professional work in the field of computational linguistics or for additional graduate study in computational linguistics and theoretical linguistics. An application should be submitted no later than the start of the first semester of the student's senior year.

### Program of Study

Students admitted to the program must fulfill the following requirements, in addition to completing their BA: a schedule of course work designed in conjunction with and approved by the director of graduate studies consisting of nine courses, which includes: four to five core courses, three to four electives, and either an internship in computational linguistics or a master's thesis. The specific course work will vary according to the student's background in computer science and/or linguistics; however all students will be required to complete COSI 114b and 217a. Depending on the student's preparation for the program, additional courses beyond the nine may be required.

### Residence Requirement

The minimum residence requirement is one year after completing the BA degree.

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## Special Notes Relating to Undergraduates

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Students may submit a written request to count a course from another department to satisfy one of the required computer science electives. Approval of such a request is based on the relationship of this course to the student's other computer science electives.

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## Requirements for the Postbaccalaureate Certificate in Computer Science

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**A.** Introductory courses: COSI 11a, 21a.

**B.** Core courses: COSI 21b, 22b, 29a, 30a, and 31a.

**C.** Electives: At least four additional COSI courses, excluding COSI 2a and 99d. At most, two electives can be cross-listed courses.

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## Combined Postbaccalaureate/MA Program

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Available only to Brandeis students who have completed all requirements for the postbaccalaureate certificate. Students should propose a course of study that typically consists of six graduate-level courses, which may include independent study.

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## Special Notes Relating to Postbaccalaureate Students

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Postbaccalaureate students with a programming background may ask to be exempted from the introductory courses COSI 11a and COSI 21a. They may also submit a petition to replace core courses (in which they have previous work experience or study) with electives. Students with no previous background are encouraged to take the introductory courses in Summer School and then complete the remaining core and elective courses during the following academic year.

## Requirements for the Degree of Master of Arts

### Computer Science

#### Program of Study

Satisfactory completion of an approved schedule of nine courses numbered 100 or above, which generally must include at least two courses from each of the following groups:

**A.** AI Group: COSI 111a, 112a, 113b, 114b, 120a, 200a, 200b, 210a, 210b, 215a, 216a, 217a, 300a, 300b.

**B.** Languages and Systems Group: COSI 120a, 127b, 140a, 146a, 147a, 150a, 155b, 200a, 200b, 210a, 210b, 220a, 227b, 300a, 300b.

**C.** Algorithms and Theory Group: COSI 120a, 160a, 170a, 171a, 175a, 180a, 188a, 190a, 200a, 200b, 210a, 210b, 240b, 300a, 300b.

#### Residence Requirement

The minimum residency requirement is one and a half years.

### Computational Linguistics

#### Program of Study

The two-year MA program in computational linguistics is designed for outstanding students, preferably with an undergraduate degree in either language and linguistics or computer science. The MA provides a solid foundation for professional work in the field of computational linguistics or pursuit of a PhD in computational linguistics and theoretical linguistics.

Students must complete a schedule of course work designed in conjunction with and approved by the director of graduate studies consisting of nine courses, which includes: four to five core courses, three to four electives, and either an internship in computational linguistics or a master's thesis. The specific course work will vary according to the student's background in computer science and/or linguistics; however all students will be required to complete COSI 114b and 217a. Depending on the student's preparation for the program, additional courses beyond the nine may be required.

#### Residence Requirement

The minimum residence requirement is two years.

## Courses of Instruction

### (1–99) Primarily for Undergraduate Students

#### COSI 2a Introduction to Computers

[ sn ]

An introduction to the basic principles underlying computer hardware and software and to the implications of the wider use of computers in society. Topics will include hardware, software, Web page design, applet and servlet programming, the Internet, privacy and security issues, as well as a survey of current research directions, including artificial intelligence and parallel computing. Usually offered every year.

Mr. Hickey

#### COSI 11a Programming in Java and C

[ sn ]

A general introduction to structured programming and problem solving using C and Java in the context of the World Wide Web. Students also learn GUI programming and advanced HTML authoring. There are weekly programming assignments. Computer science majors with adequate programming skills may wish to take COSI 21a directly.

Usually offered every year.

Staff

#### COSI 21a Data Structures and the Fundamentals of Computing

[ qr1 sn ]

*Prerequisite: COSI 11a or programming facility in C. Corequisite: COSI 22a. This course satisfies the quantitative reasoning requirement only when taken with the corresponding lab.*

An introduction to the fundamental concepts of computation: discrete structures (sets, relations, functions, sequences, graphs), the fundamental data structures and algorithms for sorting and searching (lists, queues, dequeues, heaps, hashing, binary trees, tries), and the analysis of algorithms (predicate logic, termination and correctness proofs, computational complexity). The associated laboratory course is COSI 22a. Usually offered every year.

Mr. Storer

## Requirements for the Degree of Doctor of Philosophy

### Adviser

By the end of the first year, the student must obtain the consent of a computer science faculty member to serve as adviser and dissertation committee chair.

### Course Requirements

The same as those for the Master of Arts.

### Teaching Requirement

The mentoring, training, and evaluation of teaching fellows is an ongoing and important component of the graduate program. Students normally teach one course per year, beginning as graders of problem sets and assignments, and move progressively to higher levels of involvement with teaching in courses across the curriculum. They participate in the design and delivery of course lectures and each year, under the guidance of their faculty, they present several lectures. Whether students are preparing for an academic and research career or an industry position, the teaching fellow experience is valuable training in course preparation and technical communication.

### Thesis Committee and Proposal

1. Establishment by the adviser and the director of graduate studies of a thesis committee consisting of the adviser, two other Brandeis faculty, and one appropriate external member from outside Brandeis.

2. An approved, written thesis proposal by the candidate that surveys the relevant literature and states the goals of the dissertation and topics to be investigated (including aspects already completed or underway), along with an oral presentation to the thesis committee that is open to computer science faculty who wish to attend.

### Thesis Defense

Public defense of a completed dissertation will be announced three weeks in advance. Copies of the complete thesis will be available to the faculty during these three weeks.

### Residence Requirement

The minimum residency requirement is three years.

**COSI 21b Structure and Interpretation of Computer Programs**

[ sn qr1 ]

*Prerequisites: COSI 21a, COSI 22a.**Corequisite: COSI 22b. This course satisfies the quantitative reasoning requirement only when taken with the corresponding lab.*

An introduction to the fundamental models of computation: functional programming, abstract data types, imperative programming, object-oriented programming, data-driven programming, meta-linguistic abstraction, and logic programming. The associated laboratory course is COSI 22b. Usually offered every year.

Mr. Mairson

**COSI 22a Fundamentals of Programming**

[ qr2 ]

*Corequisite: COSI 21a. May yield half-course credit toward rate of work and graduation.**Two semester-hour credits.*

An introduction to the tools and techniques needed to design, construct, verify, analyze, and maintain programs. One afternoon a week and one one-hour lecture a week.

Usually offered every year.

Mr. Storer

**COSI 22b Programming Paradigms**

[ qr2 ]

*Prerequisites: COSI 21a, COSI 22a.**Corequisite: COSI 21b. May yield half-course credit toward rate of work and graduation.**Two semester-hour credits.*

A practical introduction to the use of appropriate computational paradigms and programming methodologies to solve complex problems. Problem domains vary from year to year but typically include numerical programming, symbolic computation, natural language processing, simulation of physical systems, interpretation and compilation of programming languages. One afternoon a week and one one-hour lecture a week.

Usually offered every year.

Mr. Mairson

**COSI 25a Human-Computer Interaction**

[ sn ]

*Prerequisite: COSI 2a, or COSI 11a, or permission of the instructor. This course may not be repeated for credit by students who have taken COSI 125a in previous years.*

Covers the basic theory and concepts of human-computer interaction. Topics include methodologies for designing and testing user interfaces, interaction styles and techniques, design guidelines, intelligent user interfaces, hypermedia, adaptive systems, information search and visualization, and computer supported cooperative work. The laboratory work is designed to give the student practice in a set of basic techniques used in the area of human-computer interaction. Usually offered every second year.

Mr. Alterman

**COSI 29a Discrete Structures**

[ sn ]

Covers topics in discrete mathematics with applications within computer science. Some of the topics to be covered include graphs and matrices; principles of logic and induction; number theory; counting, summation, and recurrence relations; discrete probability.

Usually offered every year.

Mr. Gessel

**COSI 30a Introduction to the Theory of Computation**

[ sn ]

*Prerequisites: COSI 21a,b; COSI 22a,b; COSI 29a.*

Formal treatment of models of computation: finite automata and regular languages, pushdown automata and context-free languages, Turing machines, and recursive enumerability. Church's thesis and the invariance thesis. Halting problem and undecidability, Rice's theorem, recursion theorem. Usually offered every year.

Mr. Mairson

**COSI 31a Computer Structures and Organization**

[ sn ]

*Prerequisites: COSI 21a,b; COSI 22a,b.*

Processors, memories, and peripherals and their interactions. Fundamental structures of computers from logic gates and circuits, through machines and assembly language, to the overall structure of operating systems.

Usually offered every year.

Ms. Shrira

**COSI 33b Internet and Society**

[ sn ]

*Prerequisite: COSI 2a or COSI 21a.*

An interdisciplinary survey of the Internet. Taught by a team of professors from several different departments, the course content will vary from year to year. Some particular topics to be covered are the architecture of the Internet (and the implications this has on its regulation), intellectual property, privacy, censorship, e-commerce, online education, and research. Usually offered every year.

Mr. Hickey

**COSI 65a Introduction to 3-D Animation**

[ sn ]

Covers the fundamental concepts of 3-D animation and teaches both the theory underlying 3-D animation as well as the skills needed to create 3-D movies. Students demonstrate their understanding of the concepts by creating several short animated movies. Usually offered every third year.

Mr. Hickey

**COSI 93a Research Internship and Analysis**

Provides students with an opportunity to work in a computer science research lab for one semester, pursuing a project that has the potential to produce new scientific results. Students and the faculty member mutually design a project for the semester that supports the research agenda of the group. Students must attend all research group meetings and present their findings in oral and written form at the end of the semester. The project typically includes background research, some lab work, and collaboration with other group members. Course requires signature of the instructor, is subject to the availability of undergraduate research positions, and is typically open only to juniors and seniors.

Staff

**COSI 98a Independent Study**

Open to exceptional students who wish to study an area of computer science not covered in the standard curriculum. Usually offered every year.

Staff

**COSI 98b Independent Study**

Open to exceptional students who wish to study an area of computer science not covered in the standard curriculum. Usually offered every year.

Staff

**COSI 99d Senior Research***Prerequisites: Open only to seniors. A GPA of 3.50 or higher in the major after completing spring semester of the junior year.**Submission of a thesis proposal during the spring semester of the junior year. This proposal must be signed by a faculty member who has agreed to supervise the thesis.*

Research assignments and preparation of a report under the direction of an instructor. Usually offered every year.

Staff

**(100–199) For Both Undergraduate and Graduate Students****COSI 101a Fundamentals of Artificial Intelligence**

[ sn ]

*Prerequisites: COSI 21a,b; COSI 22a,b; COSI 29a. This course may not be repeated for credit by students who have taken COSI 35a in previous years.*

Survey course in artificial intelligence. Introduction to Lisp and heuristic programming techniques. Topics include problem solving, planning natural language processing, knowledge representation, and computer vision. Usually offered every year.

Mr. Pollack

**COSI 111a Topics in Computational Cognitive Science**

[ sn ]

*Prerequisite: COSI 101a (formerly COSI 35a), or COSI 25a (formerly COSI 125a) or permission of the instructor.*

Focuses on the cognitive aspects of computer-mediated group problem solving. Topics include computer-supported cooperative work, the role of convention in the coordination of activity, problem solving and skill acquisition, adaptive systems, distributed cognition, and discourse. The laboratory work is designed to give the student practice with the ideas and techniques under discussion. Usually offered every year.

Mr. Alterman

**COSI 112a Modal, Temporal, and Spacial Logic for Language**

[ sn ]

*Prerequisites: COSI 21b or COSI 29a; COSI 101a (formerly COSI 35a).*

Topics include logics for world modeling, representation of goals and plans, action theory, models of shared knowledge, learning theories for environmental modeling, and the social construction of concepts. Usually offered every third year.

Mr. Pustejovsky

**COSI 113b Machine Learning**

[ sn ]

*Prerequisite: COSI 101a (formerly COSI 35a).*

A seminar on genetic algorithms, genetic programming, evolutionary programming, blind watchmaking, and related topics, ultimately focusing on co-evolutionary spirals and the automatic construction of agents with complex strategies for games. Usually offered every second year.

Mr. Pollack

**COSI 114b Topics in Computational Linguistics**

[ sn ]

*Prerequisites: COSI 21b or COSI 29a; COSI 101a (formerly COSI 35a).*

Provides a fundamental understanding of the problems in natural language understanding by computers, and the theory and practice of current computational linguistic systems. Of interest to students of artificial intelligence, algorithms, and the computational processes of comprehension and understanding. Usually offered every year.

Mr. Pustejovsky

**COSI 118a Computer-Supported Cooperation**

[ sn ]

*Prerequisite: COSI 25a (formerly COSI 125a) or the permission of the instructor.*

Covers basic theory and concepts of computer-supported collaborative work and learning. Laboratory work enables the student to practice a set of basic techniques as they apply to the development of computer-mediated collaboration. The content and work of the course are specifically designed for an interdisciplinary class of students from computer science and the social sciences. Usually offered every second year.

Mr. Alterman

**COSI 120a Topics in Computer Systems**

[ sn ]

*Prerequisite: COSI 21a.*

Content will vary from year to year. May be repeated for credit. Prerequisites may vary with the topic area; check with instructor for details. Usually offered every third year.

Staff

**COSI 123a Statistical Machine Learning**

[ qr sn ]

*Prerequisite: MATH 10a, MATH 15a or familiarity with basic concepts in probability and statistics and differential calculus.*

Focuses on learning from data using statistical analysis tools and deals with the issues of designing algorithms and systems that automatically improve with experience. This course is designed to give students a thorough grounding in the methodologies, technologies, mathematics, and algorithms currently needed by research in learning with data. Usually offered every year.

Mr. Hong

**COSI 127b Database Management Systems**

[ sn ]

*Prerequisites: COSI 21a, COSI 22a, and COSI 29a.*

Introduces database structure, organization, and languages. Studies relational and object-oriented models, query languages, optimization, normalization, file structures and indexes, concurrency control and recovery algorithms, and distributed databases. Usually offered every second year.

Mr. Cherniack

**COSI 128a Modern Database Systems**

[ sn ]

*Prerequisite: COSI 127b.*

Covers advanced topics in database systems such as concurrency control, recovery, security, and data mining. Usually offered every fourth year.

Mr. Cherniack

**COSI 140a Logic Programming**

[ sn ]

*Prerequisite: COSI 31a.*

Studies the relationship of Prolog to predicate calculus, horn clauses, unification algorithms, intelligent backtracking, infinite trees, inequalities, implementation issues, and concurrent Prolog. Usually offered every second year.

Mr. Cohen

**COSI 146a Fundamentals of Operating Systems**

[ sn ]

*Prerequisites: COSI 21a,b; COSI 22a,b; COSI 31a; MATH 10a (MATH 10b recommended). This course may not be repeated for credit by students who have taken COSI 46a in previous years.*

Design of systems that share resources. Specific topics: naming, binding, protection, reliability, synchronization, scheduling, storage allocation, interprocess communication. Usually offered every second year.

Staff

**COSI 147a Networks and Distributed Computing**

[ sn ]

*Prerequisite: COSI 31a or the equivalent, COSI 146a (formerly COSI 46a), C/C++/UNIX programming skills.*

Introduces state-of-the-art networking technologies, architectures, and protocols, with an emphasis on the Internet and the World Wide Web. Specific topics include naming and RPC at the application level, TCP/IP and UDP/IP at the transport/network levels, and Ethernet, ATM, FDDI, and wireless technologies at the physical level. Usually offered every second year.

Ms. Shrira

**COSI 155b Computer Graphics**

[ sn ]

An introduction to the art of displaying computer-generated images and to the design of graphical user interfaces. Topics include graphic primitives; representations of curves, surfaces, and solids; and the mathematics of two- and three-dimensional transformations. Usually offered every third year.

Staff

**COSI 160a Parallel Computing and Programming**

[ sn ]

*Prerequisites: COSI 29a and COSI 31a.*

An introduction to parallel computation at the levels of architecture, communication, data structures, algorithms, analysis, programming models, and programming languages. Usually offered every second year.

Staff

**COSI 170a Information Theory and Coding**

[ sn ]

*Prerequisites: COSI 29a and COSI 30a, MATH 10a.*

Information theory as applied to the problems of rewriting digital data to be more concise, more error-resistant, or more appropriate to physical environments. Usually offered every second year.

Staff

**COSI 171a Cryptology: Cryptography and Cryptanalysis**

[ sn ]

*Prerequisites: COSI 21a and COSI 29a.*

The study of data secrecy, privacy, and security. How can information be encoded so that an adversary cannot alter it, forge it, or gain any knowledge of it? Usually offered every second year.

Staff

**COSI 175a Data Compression and Multimedia Processing**

[ sn ]

*Prerequisites: COSI 21a, COSI 29a, COSI 30a, and COSI 31a.*

Selected topics in data compression and image and video processing, including adaptive lossless compression, lossy image and video compression, transformations on image and video, multimedia retrieval problems, parallel algorithms. Usually offered every second year.

Mr. Storer

**COSI 178a Computational Molecular Biology**

[ sn ]

*Prerequisites: COSI 11a and COSI 30a. COSI 30a must be taken before or concurrently with this course.*

An overview of basic concepts in molecular biology. Topics include algorithmic coverage of pattern matching, strings, graphs, fragment assembly of DNA, physical mapping of DNA, phylogenetic tree reconstruction, detection of introns and exons, formal language view of DNA, and biological computers. Usually offered every third year.

Mr. Cohen

**COSI 180a Algorithms**

[ sn ]

*Prerequisites: COSI 21a,b, and COSI 29a.*

*This course may not be repeated for credit by students who have taken COSI 30b in previous years.*

Basic concepts in the theory of algorithm design and analysis, including advanced data structures and algorithms, parallel algorithms, and specialized topics. Usually offered every second year.

Staff

**COSI 190a Introduction to Programming Language Theory**

[ sn ]

*Prerequisite: COSI 21a or familiarity with a functional programming language, set theory, and logic.*

Lambda calculus and combinatory logic: Church-Rosser theorem, continuity and computability, denotational semantics, model theory. Typed lambda calculi: strong normalization, representability, completeness of equational reasoning, Curry-Howard isomorphism. Introduction to ML:

polymorphism and type inference, module system. Category theory: categorical combinators and compilation, continuations, monads. Usually offered every second year.

Mr. Mairson

**(200 and above) Primarily for Graduate Students****COSI 200a Readings**

Specific sections for individual faculty members as requested.

Staff

**COSI 200b Readings**

Specific sections for individual faculty members as requested.

Staff

**COSI 210a Independent Study**

Usually offered every year.

Staff

**COSI 215a Advanced Topics in Artificial Intelligence**

Topics vary from year to year. The course may be repeated with the approval of the instructor. Usually offered every second year.

Staff

**COSI 216a Topics in Natural Language Processing**

*Prerequisite: COSI 101a (formerly COSI 35a).*

Reviews recent trends in computational approaches to linguistics, semantics, knowledge representation for language, and issues in parsing and inferences. Usually offered every fourth year.

Mr. Pustejovsky

**COSI 217a Topics in Adaptive Systems**

*Prerequisite: COSI 101a (formerly COSI 35a).*

In nature, systems with greater complexity than any designed by humans arise without a designer. The central question explored is: How can complex modular organization arise without an intelligent designer? The class reads about theories of organization in different settings and scales (cells, brains, minds, behavior, society, economies), and studies papers, models, and algorithms from a variety of fields that might shed light on the issue. Usually offered every third year.

Mr. Pollack

**COSI 217b Natural Language Processing Systems**

*Prerequisite: COSI 114b or permission of the instructor.*

This course looks at building coherent systems designed to tackle real applications in computational linguistics. Particular topics will vary from year to year, but each call will consider some of the following: machine (aided) translation, speech interfaces, information retrieval/extraction, natural language question answering systems, dialogue systems, summarization, computer-assisted language learning, language documentation/linguistics hypothesis testing, and handwriting recognition. Usually offered every year.

Staff

**COSI 220a Advanced Topics in Systems**

*Prerequisite: COSI 31a.*

Covers selected areas in advanced computer systems and engages students in top-flight systems research. The class is based on a discussion of important research papers and a research project. Usually offered every second year.

Ms. Shriram

**COSI 227b Advanced Topics in Database Systems**

*Prerequisite: COSI 127b.*

An in-depth treatment of advanced topics in database management systems. Topics vary from year to year and may include distributed databases, query processing, transaction processing, and Web-based data management. Usually offered every second year.

Mr. Cherniack

**COSI 230a Topics in Computational Biology**

This course aims to transcend traditional departmental boundaries and facilitate communications between experimental biologists and computational scientists. Through reading literature and small research projects, students will be introduced to problems in computational biology and learn the methods for studying them.

Mr. Hong

**COSI 240b Computational Logic**

*Prerequisite: Some previous exposure to logic, computation theory, and functional programming.*

An introduction to logic in computer science. Propositional and first-order logic: completeness, compactness, unification and resolution theorem proving, and circuit and query complexity. Intuitionistic logic: Curry-Howard isomorphism, normalization, Kripke models, and double-negation embeddings. Higher-order logic: Godel's "dialectica" theorem, program synthesis, and decision problems. Usually offered every second year.

Mr. Mairson

**COSI 300a Master's Project**

Usually offered every year.

Staff

**COSI 300b Master's Project**

Usually offered every year.

Staff

**COSI 310a Seminar in Artificial Intelligence**

Usually offered every second year.

Staff

**COSI 315b Current Topics in Learning and Neural Nets**

Usually offered every second year.

Staff

**COSI 340a Seminar in Programming Languages**

Usually offered every second year.

Staff

**COSI 390a Seminar in Theory of Computation**

Usually offered every second year.

Staff

**COSI 400d Dissertation Research**

Specific sections for individual faculty members as requested.

Staff

**Cross-Listed Courses****ANTH 138a**

Social Relations in Cyberspace

**ANTH 174b**

Virtual Communities

**BCHM 170b**

Bioinformatics

**CHEM 144a**

Computational Chemistry

**LING 130a**

Formal Semantics: Truth, Meaning, and Language

**MATH 30a**

Introduction to Algebra, Part I

**MATH 30b**

Introduction to Algebra, Part II

**MATH 36a**

Probability

**MATH 38b**

Number Theory

**MATH 39a**

Introduction to Combinatorics

**PHIL 106b**

Mathematical Logic

**PHYS 29a**

Electronics Laboratory I

**PHYS 29b**

Electronics Laboratory II

**PHYS 32b**

Microprocessor Laboratory

A graduate program

**Cultural Production**

Courses of Study:

Master of Arts

**Objectives**

The graduate program in cultural production, leading to the MA degree, provides students with theoretical perspectives and practical experience for analyzing the dynamic intersections of art, imagination, technology, politics, and public spheres. The courses in the program investigate how historical, expressive, and aesthetic representations are generated, circulated, and interpreted in both local and global contexts. Incorporating humanistic, artistic, and social scientific perspectives, the program permits students to explore their varied interests in, such topics as, ethnic festivals, verbal arts, social memory, aesthetic creativity, museum exhibitions, public history, cultural heritage, historical preservation, archival documentation, digital technologies, and visual media. In addition to mastering analytical and comparative skills necessary for the study of cultural forms and their public spheres, students gain practical expertise, through credit-earning internships, in developing and coordinating cultural productions ranging from museum installations and heritage festivals to civic memorials and historical archives.

Students may complete the program's degree requirements of eight courses in two semesters; however, it is expected that many students will enroll part-time, while keeping jobs at local-area institutions and organizations. Enrollment will also be open on a course-by-course basis for interested professionals or professionals-in-training.

**How to Be Admitted to the Graduate Program**

The general requirements for admission to the Graduate School, given in an earlier section of this *Bulletin*, apply to candidates for admission to this area of study. Candidates must also submit a personal statement that discusses their reasons for applying for this MA, and their academic training, career objectives, relevant experience, and current institutional affiliation (if any). Three letters of recommendation are required. Students are encouraged, though not required, to visit the campus and to talk to the director and other members of the faculty committee.

**Faculty Committee**

**Mark Auslander, Director**  
(Anthropology)

**Aliyyah Abdur-Rahman (on leave 2008–2009)**  
(English and American Literature)

**Mary Baine Campbell**  
(English and American Literature)

**Cynthia Cohen**  
(Coexistence and Conflict)

**Judith Eissenberg**  
(Music)

**Tory Fair**  
(Fine Arts)

**Jane Hale**  
(Romance Studies)

**Paul Jankowski (on leave 2008–2009)**  
(History)

**Peter Kalb**  
(Fine Arts)

**Allan Keiler**  
(Music)

**Thomas King**  
(English and American Literature)

**James Mandrell**  
(Romance Studies)

**Charles McClendon**  
(Fine Arts)

**Laura J. Miller**  
(Sociology)

**Richard Parmentier (on leave fall 2008)**  
(Anthropology)

**John Plotz**  
(English and American Literature)

**Jonathan Sarna**  
(Hornstein Jewish Professional Leadership Program; Near Eastern and Judaic Studies)

**Harleen Singh (on leave spring 2009)**  
(German, Russian, and Asian Languages and Literature; Women's and Gender Studies)

**Ellen Schattschneider**  
(Anthropology)

**Nancy Scott**  
(Fine Arts)

**Faith Smith (on leave 2008–2009)**  
(English and American Literature; African and Afro-American Studies)

## Requirements for the Degree of Master of Arts

### Program of Study

This graduate program involves a minimum of one academic year in residence at Brandeis in which students complete eight semester courses, including an internship course and a master's research paper course.

In consultation with the director, each entering student selects an area of concentration from one of the following three clusters:

#### Cluster 1: Performance: Object/Body/Place

Courses in performance theory, theater, discursive practice, embodiment, mythopoesis, adornment, and the city as lived text.

#### Cluster 2: Visuality: Image/Media/Signs

Courses in comparative experiences of vision, cinema, television, digital and other new media, Internet studies, materiality, photography, advertising, and mass communications.

#### Cluster 3: Memory: Museums/Preservation/Archives

Courses in historical consciousness, the politics and poetics of museums and memorials, traumatic memory, historical methods, artifact conservation, documentation, and archival practice.

Students take eight semester courses, including:

A. CP 201a (Making Culture: Theory and Practice)

B. CP 202b (Internship in Cultural Production)

C. CP 203a (Directed Research in Cultural Production for MA Students)

D. Two courses in the student's concentration cluster, one of which is identified as a core course in that cluster.

E. Two elective courses, one from each of the other two clusters.

F. One additional course from the program's electives or another Brandeis course approved by the director.

### Residence Requirement

The residence requirement for this program is one year of full-time study.

### Language Requirement

There is no foreign language requirement for the master's degree.

Under exceptional circumstances, a student may petition to the director of the program for permission to write a master's thesis (in contrast to the normally expected Master's paper.) It is expected that the thesis will be in the seventy-five to one hundred page range; the thesis must involve independent research and represent an original scholarly contribution. A two- to three-page written proposal to write a thesis, signed by the student's adviser, should be submitted to the director within the first four weeks of the semester in which the student intends to graduate. The completed thesis will be evaluated by two faculty members, selected by the director in consultation with the student. The student is responsible for submitting an electronic copy of the thesis, in accordance with university regulations.

## Courses of Instruction

### (200 and above) Primarily for Graduate Students

#### CP 201a Making Culture: Theory and Practice

Examines theories of mass, public, popular, and elite culture. Surveys the social dynamics of remembrance, visuality, and performance. Discusses how culture forms emerge in "high" and "low" contexts, from media conglomerates and major museums to "outsider" artists, indigenous communities, and street performers. Usually offered every year.  
Mr. Auslander

#### CP 202b Internship in Cultural Production

Interning in a cultural institution (such as a museum, heritage site, or national park), the student participates in the development of a specific project or cultural production, such as an exhibition or public program. Students write a report on their experiences and give a presentation on their internship work at an annual workshop/conference. We anticipate the development of summer practicum or internship courses on museums and cultural production to be held alternately in South Africa, Mississippi, and Scotland. Usually offered every semester.  
Mr. Auslander

#### CP 203a Directed Research in Cultural Production for MA Students

Independent research on a topic approved by the director and mentored by the student's adviser, leading to a written master's paper. Usually offered every semester.  
Staff

#### CP 298a Independent Study

Staff

#### CP 301a Readings in Cultural Production

Mr. Auslander

### Cluster 1: Performance: Object/Body/Place

#### Core Courses

##### ANTH 105a

Myth and Ritual

##### ANTH 114b

Verbal Art and Cultural Performance

##### ENG 151b

Theater/Theory: Investigating Performance

##### ENG 181a

Making Sex, Performing Gender

##### THA 130a

Suzuki



**Elective Courses****ANTH 112a**

African Art and Aesthetics

**ANTH 115b**

Space and Landscape

**ENG 144b**

The Body as Text

**ENG 177b**

American Popular Music and Contemporary Fiction

**ENG 280a**

Making It Real: Tactics of Discourse

**FREN 142b**

City and the Book

**HIST 140a**

A History of Fashion in Europe

**MUS 160a**

Digital Pop from Hip-Hop to Mashup

**MUS 209a**

Seminar in Psychoanalysis and Biography: The Psychoanalytic Study of the Artist

**NEJS 161b**

Representations of the City in Literature, Art, and Architecture

**Cluster 2: Visuality: Image/Media/Signs****Core Courses****AMST 130b**

Television and American Culture

**ANTH 126b**

Symbol, Meaning, and Reality: Explorations in Cultural Semiotics

**ANTH 130b**

Visuality and Culture

**ANTH 184b**

Cross-Cultural Art and Aesthetics

**FA 102a**

American Avant-Garde Film and Video

**FILM 100a**

Introduction to the Moving Image

**JOUR 103b**

Advertising and the Media

**PHIL 113b**

Aesthetics: Painting, Photography, and Film

**SOC 120b**

Globalization and the Media

**SOC 146a**

Mass Communication Theory

**Elective Courses****ANTH 128a**

Meaning and Material Culture

**ENG 101b**

Cyber-Theory

**ENG 280a**

Making It Real: Tactics of Discourse

**GECS 150a**

From Rapunzel to Riefenstahl: Real and Imaginary Women in German Culture

**GECS 167a**

German Cinema: Vamps and Angels

**HISP 195a**

Latinos in the United States: Perspectives from History, Literature, and Film

**SOC 221b**

Sociology of Culture

**THA 155a**

Icons of Masculinity

**Cluster 3: Memory: Museums/Preservation/Archives****Core Courses****ANTH 108b**

History, Time, and Tradition

**ANTH 159a**

Museums and Public Memory

**ANTH 207b**

Trauma: Theory and Experience

**HIST 204b**

Narrative Strategies: Writing History in a Postmodern Age

**NEJS 181b**

Film and the Holocaust

**Elective Courses****AMST 144b**

Signs of Imagination: Gender and Race in Mass Media

**COEX 250a**

The Arts of Building Peace

**ED 158b**

Looking with the Learner: Practice and Inquiry

**ENG 127b**

Migrating Bodies, Migrating Texts

**ENG 128a**

Alternative Worlds: Modern Utopian Texts

**ENG 147b**

South African Literature and Apartheid

**ENG 211a**

Psychoanalytic Theory

**ENG 237a**

Reading the Black Transnation

**GECS 160a**

In the Shadow of the Holocaust: Global Encounters

**HIST 169a**

Thought and Culture in Modern America

**HIST 170a**

Italian Films, Italian Histories

**JAPN 130a**

The Literature of Multicultural Japan

**NEJS 133a**

Art, Artifacts, and History: The Material Culture of Modern Jews

**NEJS 184a**

Introduction to Jewish Museum Studies

**NEJS 190a**

Describing Cruelty

**NEJS 291a**

History and Memory in the Middle East

**SAS 140a**

We Who Are at Home Everywhere: Narratives from the South Asian Diaspora

**SOC 148b**

Sociology of Information