DOCTOR OF PHILOSOPHY WITH A MAJOR IN ALGORITHMS, COMBINATORICS, AND OPTIMIZATION

One of the most rapidly growing areas of research in applied mathematics, computer science, and operations research has been dealing with discrete structures. This has been most evident in the fields of combinatorics, discrete optimization, and the analysis of algorithms. Increasingly, work in each of these subjects has come to depend on knowledge of all of them. Indeed, many of the most significant advances have resulted from the efforts of researchers in more than one, if not all three, of these areas.

In response to these developments, Georgia Tech has introduced a doctoral degree program in Algorithms, Combinatorics, and Optimization (ACO). This multidisciplinary program is sponsored jointly by the School of Mathematics, the School of Industrial and Systems Engineering, and the College of Computing. Faculty for the program are drawn from these three sponsoring units, as well as from the School of Electrical and Computer Engineering and the College of Business.

The ACO program is arranged to bring together the study of discrete structures and the design and analysis of algorithms in areas such as graph theory, integer programming, combinatorial optimization, and polyhedral theory. It is intended for students possessing a strong background in one or more of the fields represented by the three sponsoring units. Each student in the program has a single home department chosen from the School of Mathematics, the School of Industrial and Systems Engineering, and the College of Computing. Courses for the program are drawn from all three of these units, and include study in such areas as combinatorial methods, algebraic structures, probability, the analysis of algorithms, computational complexity, linear programming, discrete optimization, and convex analysis.

The College of Computing is one of the sponsors of the multidisciplinary program in Algorithms, Combinatorics, and Optimization (ACO), an approved doctoral degree program at Georgia Tech. The other sponsoring units are the Stewart School of Industrial and Systems Engineering and the School of Mathematics. The degree program is administered by an oversight committee drawn primarily from the sponsoring units.

The study of discrete structures is a rapidly growing area in computer science, applied mathematics, and operations research, most obviously in the analysis of algorithms, combinatorics, and discrete optimization. Collaborative work among the three traditionally separate disciplines is already common. The doctorate in Algorithms, Combinatorics, and Optimization will prepare students for careers in this exciting and expanding field.

Students are expected to be well prepared in at least one of the three fields represented by the sponsoring units (computer science, mathematics, and operations research). Each student in the program is admitted through one of the three sponsoring units, which serves as the home department. Coursework is drawn from all three disciplines. The research advisor may be any member of the ACO program faculty, which is drawn from electrical and computer engineering, management, and other disciplines in addition to the three sponsoring units.

PhD A.C.O. Information

Regardless of the home department, each ACO student must complete the ACO core courses. At least 15 hours of course work beyond the program core must also be completed; some of these additional courses are specified by the student's home department. All required courses must be passed with a grade of B or higher. Other requirements include the minor field of study, passing the comprehensive examination, defending a research proposal, and successful defense of the dissertation.

All PhD programs must incorporate a standard set of Requirements for the Doctoral Degree.

Code	Title	Credit Hours
Core Courses		
CS 6550	Design and Analysis of Algorithms	3
CS 6505	Computability, Algorithms, and Complexity [1]	3
or CS 6520	Computational Complexity Theory	
ISYE 7661	Theory of Linear Inequalities	3
ISYE 7686	Advanced Combinatorial Optimization	3
MATH 6014	Graph Theory and Combinatorial Structures	3
MATH 6121	Modern Abstract Algebra I [2]	3
MATH 7018	Probabilistic Methods in Combinatorics	3
Total Credit Hours		**21**

[1] School of Computer Science students must select CS 6520
[2] Industrial and Systems Engineering students may substitute MATH 6112

Additional Course Requirements

Each student must complete at least 15 hours of course work at the 6000-level or higher in addition to the core courses. The following courses are required, depending on the student's home department

Code	Title	Credit Hours
School of Computer Science		
Two theory courses at the leve of 7000 or above		
School of Industrial and Systems Engineering		
ISYE/MATH 6761	Stochastic Processes I	3
ISYE 6663	Nonlinear Optimization	3
School of Mathematics		
MATH 6337	Real Analysis I	3
Two courses selected from:		
MATH 6321	Functions of a Complex Variable I	3
MATH 6112	Advanced Linear Algebra	3
A 6000-level or above topology/geometry course		