

CSE 6332 (Approved): Advanced Algorithms

Course Description

Advanced graph algorithms, string algorithms, linear programming, matrix operations, Fourier transforms, randomized algorithms, approximation algorithms, geometric algorithms.

Prior Course Number: CSE 790

Transcript Abbreviation: Advanced Algs

Grading Plan: Letter Grade

Course Deliveries: Classroom

Course Levels: Graduate

Student Ranks: Senior, Masters, Doctoral

Course Offerings: Autumn

Flex Scheduled Course: Never

Course Frequency: Every Year

Course Length: 14 Week

Credits: 3.0

Repeatable: No

Time Distribution: 3.0 hr Lec

Expected out-of-class hours per week: 6.0

Graded Component: Lecture

Credit by Examination: No

Admission Condition: No

Off Campus: Never

Campus Locations: Columbus

Prerequisites and Co-requisites: CSE 6331 or CSE 780

Exclusions: Not open to students with credit for CSE 790 or CSE 794A

Cross-Listings:

The course is required for this unit's degrees, majors, and/or minors: No

The course is a GEC: No

The course is an elective (for this or other units) or is a service course for other units: Yes

Subject/CIP Code: 14.0901

Subsidy Level: Doctoral Course

Programs

Abbreviation	Description
BS CSE	BS Computer Science and Engineering
MS CSE	MS Computer Science and Engineering
PhD CSE	PhD Computer Science and Engineering

Course Goals

Be familiar with advanced topics in algorithms such as advanced graph algorithms, string algorithms, linear programming, matrix operations, Fourier transforms, randomized algorithms, approximation algorithms, geometric algorithms
Master a subset of algorithms: Linear programming, advanced graph algorithms, approximation algorithms
Be familiar with how to design algorithms for problems in applications

Course Topics

Topic	Lec	Rec	Lab	Cli	IS	Sem	FE	Wor
Advanced graph algorithms	8.0							
Linear programming	5.0							
Fourier transforms and matrix operations	5.0							
String algorithms	5.0							
Randomized algorithms	6.0							
Approximation algorithms	7.0							
Geometric algorithms	6.0							

Representative Assignments

Design an algorithm for a graph problem that needs to use network flow.
Design an approximation algorithm for a known NP-hard problem

Grades

Aspect	Percent
Homework	30%
Midterm exam	30%
Final Exam	40%

Representative Textbooks and Other Course Materials

Title	Author
<i>Introduction to Algorithms</i>	T.H. Cormen, C. E. Leiserson, R. L. Rivest, C. Stein
<i>Course notes, papers</i>	Supplied by the instructor

ABET-EAC Criterion 3 Outcomes

Course Contribution		College Outcome
***	a	An ability to apply knowledge of mathematics, science, and engineering.
**	b	An ability to design and conduct experiments, as well as to analyze and interpret data.
***	c	An ability to design a system, component, or process to meet desired needs.
	d	An ability to function on multi-disciplinary teams.
**	e	An ability to identify, formulate, and solve engineering problems.
	f	An understanding of professional and ethical responsibility.
*	g	An ability to communicate effectively.
	h	The broad education necessary to understand the impact of engineering solutions in a global and societal context.
***	i	A recognition of the need for, and an ability to engage in life-long learning.
**	j	A knowledge of contemporary issues.
***	k	An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

BS CSE Program Outcomes

Course Contribution		Program Outcome
***	a	an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering;
**	b	an ability to design and conduct experiments, as well as to analyze and interpret data;
***	c	an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations;
	d	an ability to function on multi-disciplinary teams;
**	e	an ability to identify, formulate, and solve engineering problems;
	f	an understanding of professional, ethical, legal, security and social issues and responsibilities;
*	g	an ability to communicate effectively with a range of audiences;
	h	an ability to analyze the local and global impact of computing on individuals, organizations, and society;
***	i	a recognition of the need for, and an ability to engage in life-long learning and continuing professional development;
**	j	a knowledge of contemporary issues;
***	k	an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional;
**	l	an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution;
***	m	an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices;
**	n	an ability to apply design and development principles in the construction of software systems of varying complexity.

Prepared by: Tamal Dey