CSE 2331 (Approved): Foundations II: Data Structures and Algorithms

Course Description

Design/analysis of algorithms and data structures; divide-and-conquer; sorting and selection, search trees, hashing, graph algorithms, string matching; probabilistic analysis; randomized algorithms; NP-completeness.

Prior Course Number: 680
Transcript Abbreviation: Fndns II: DS & Alg
Grading Plan: Letter Grade
Course Deliveries: Classroom
Course Levels: Undergrad
Student Ranks: Sophomore, Junior
Course Offerings: Autumn, Spring, Summer
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 2231 or CSE 321) and (CSE 2321 or Math 366) and (Math 2566 or Math 566) and (Stat 3470 or Stat 427).
Exclusions: Not open to students with credit for CSE 5331 or CSE 680
Cross-Listings:

The course is required for this unit's degrees, majors, and/or minors: Yes
The course is a GEC: No
The course is an elective (for this or other units) or is a service course for other units: No

Subject/CIP Code: 14.0901
Subsidy Level: Baccalaureate Course

Programs

Abbreviation	Description
BS CSE	BS Computer Science and Engineering

Course Goals

Be competent with using asymptotic notation.
Be familiar with designing graph algorithms.
Be familiar with designing and analyzing divide-and-conquer algorithms.
Be familiar with the use of balanced trees.
Be familiar with hashing.
Be familiar with heaps.

Be familiar with designing backtracking algorithms.
Be familiar with string matching.
Be exposed to selection algorithms.
Be exposed to probabilistic algorithms.
Be exposed to formal languages and finite automata.
Be exposed to NP-completeness.

Course Topics

Topic	Lec	Rec	Lab	Cli	IS	Sem	FE	Wor
Design and analysis of recursive algorithms.	6.0							
Balanced trees and heaps.	9.0							
Hashing.	3.0							
Graph algorithms.	12.0							
Backtracking algorithms.	6.0							
Sorting and selection.	6.0							

Representative Assignments

Design and implementation of a backtracking algorithm.
Implementation and experimental comparison of deterministic and randomized selection algorithms.

Grades

Aspect	Percent
Homework	20%
Classroom participation	10%
Midterms, final	70%

Representative Textbooks and Other Course Materials

Title	Author
Introduction to Algorithms	Cormen, Leiserson, Rivest and Stein

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.

Course Contribution		College Outcome
	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.

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