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Governing Iowa's Public Universities

In accordance with Board of Regents policy 3.20, the following required information is available below:

Fall 2026

I. Course title and number as designated in the institutional course catalog

CS 1800 Discrete Structures, SPOC

II. A course description including learning objectives that students are expected to achieve by the end of the course

A. Course Description:

1. Introduction to logical forms, arguments, predicates, and quantified statements; methods of proof; elementary number theory; counting; sequences; sets; functions; relations; graphs; and Boolean algebra in the context of computer science. Prerequisite(s): CS 1130, CS 1160, or CS 1510.

B. Course Level Learning Objectives:

1. After this course, you should have developed the mathematical maturity to:
    - Understand and create a correct mathematical arguments (i.e., proofs)
    - Understand the terminology and important properties of discrete structures: sets, functions, sequences, and summations.
    - Understand the meaning of an algorithm and the ability to analyze an algorithm to determine its computational complexity (big-oh and big-Theta notation)
    - Understand mathematical induction and recursion • Understand the basics of counting: pigeonhole principle, permutations, and combinations
    - Apply the inclusion-exclusion principle for common counting problems
    - Understand an introduction to discrete probability and expected value
    - Develop recurrence relations for divide-and-conquer algorithms and to determine their complexity using the Master Theorem.
    - Understand relations, their closures, their properties, and applications to databases

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III. A general outline of the topics to be covered throughout the course:

The course is organized around the first 9 chapters of textbook below. The topics covered are:

- Propositional logic, propositional equivalences, predicates & quantifiers, rules of inference, proof methods and strategy
- Sets, functions, sequences, summations, and matrices
- Algorithms, growth of functions, and complexity of algorithms
- Number theory
- Induction and recursion
- Counting, pigeonhole principle, permutations and combinations
- Discrete probability
- Recurrence relations, divide-and-conquer algorithms, inclusion-exclusion
- Relations and their properties, n-ary relations applications, closures of relations

IV. List of required textbooks, readings, and other materials necessary for the course

Required Texts:

- Kenneth H. Rosen, Discrete Mathematics and Its Applications, Seventh Edition, 2012, ISBN-13: 978-0-07-338309-5.
- Student's Solution Guide to accompany Discrete Mathematics and Its Applications, Seventh Edition, 2012, ISBN-13: 978-0-07-735350-6.

V. General description of the types of assessments used in the course (e.g., exams, papers, projects, experiential learning):

- The course is organized around the first 9 chapters of textbook. For each chapter students read specified chapter sections, submit answers of specified chapter exercises for grading, and take an online quiz over the chapter.
- A midterm exam is taken covering chapters 1 to 4.
- A final exam is taken covering chapters 5 to 9