CIS-7 Discrete Structures Syllabus - Kasey Nguyen, PhD.

Course Description

This course is an introduction to the discrete structures used in Computer Science with an emphasis on their applications. This course meets on campus. Topics covered include: Functions, Relations and Set; Basic Logic; Proof Techniques; Basics of Counting; Graphs and Trees; and Discrete Probability. 54 hours lecture and 18 hours laboratory

Course Format

This course is a face-to-face onsite course, which requires student to attend schedule class sessions in the assigned classroom. This course is web-enhanced via Learning Management System Canvas. See WebAdvisor and school e-mail for login information to access Canvas, https://rccd.instructure.com/login/canvas

Course Content

This course will cover the following topics:

1. Functions, Relations and Sets
    a. Functions (surjections, injections, inverses, composition)
    b. Relations (reflexivity, symmetry, transitivity, equivalence relations)
    c. Sets (Venn diagrams, complements, Cartesian products, power sets)
    d. Pigeonhole principles
    e. Cardinality and countability
2. Basic Logic
    a. Propositional logic
    b. Logical connectives
    c. Truth tables
    d. Normal forms (conjunctive and disjunctive)
    e. Validity
    f. Predicate logic
    g. Universal and existential quantification
    h. Modus ponens and modus tollens
    i. Limitations of predicate logic
3. Proof Techniques
    a. Notions of implication, converse, inverse, contrapositive, negation, and contradiction
    b. The structure of mathematical proofs
    c. Direct proofs
    d. Proof by counterexample
    e. Proof by contradiction
    f. Mathematical induction
    g. Strong induction
    h. Recursive mathematical definitions
    i. Well orderings

4. Basics of Counting
    a. Counting arguments
    b. Sum and product rule
    c. Inclusion-exclusion principle
    d. Arithmetic and geometric progressions
    e. Fibonacci numbers
    f. The pigeonhole principle
    g. Permutations and combinations
    h. Basic definitions
    i. Pascal's identity
    j. The binomial theorem
    k. Solving recurrence relations
    l. Common examples
    m. The Master theorem
5. Graphs and Trees
    a. Trees
    b. Undirected graphs
    c. Directed graphs
    d. Spanning trees/forests
    e. Traversal strategies
6. Discrete Probability
    a. Finite probability space, probability measure, events
    b. Conditional probability, independence, Bayes' theorem
    c. Integer random variables, expectation
    d. Law of large numbers

Course Student Learning Outcomes:

1. Describe how formal tools of symbolic logic are used to model real-life situations, including those arising in computing contexts such as program correctness, database queries, and algorithms.
2. Relate the ideas of mathematical induction to recursion and recursively defined structures.
3. Analyze a problem to create relevant recurrence equations.
4. Demonstrate different traversal methods of trees and graphs.
5. Apply the binomial theorem to independent events and Bayes' theorem to dependent events.

Prerequisite

CIS-5 or CSC-5 with a minimum grade of C or equivalent

Knowledge and skills that you should have before entering this course include:

1. Create computer programs in C++ using the principles of structured programming.
2. Apply the principles of logical and programming concepts to develop specific solutions for business, scientific and mathematics problems.

3. Identify the information input requirements, synthesize the algorithmic steps needed to transform the data input into the required output information, and organize the output format to facilitate user communication.
4. Demonstrate the use of the C++ IDE and libraries

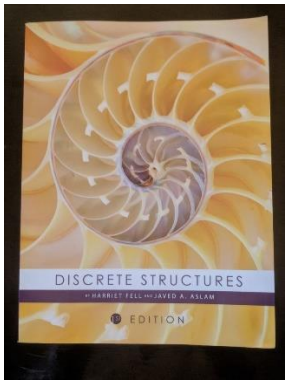
Transfer

This course fulfills the requirement for CSU and UC.

Required Materials

Textbook:

Title: **Discrete Structures**



Edition: 1st

Authors: Harriet Fell and Javed A. Aslam

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ISBN: 9781516555536

PDF: http://ccs.neu.edu/home/ntuck/courses/2015/05/cs1800/cs1800_text.pdf

Class Procedures, Activities, and Grading

This is a three-unit course, in which you will be expected to spend 12 - 14 hours per week on readings, assignments, projects, exams, and quizzes. Therefore, to receive full credit, you need to attend the lectures, read the textbook, complete assignments, labs, projects quizzes and exams in the units

Your course materials will always be available through Canvas. **The material for the course will be split into weekly units called *Modules*. These weekly *Modules* will become available before the weekly session and will close 3 weeks after due date. All assignments within the *Modules* will have assigned due date or ending date of Sunday at 11:59 pm.**

Late Assignments

Late assignments are limited to prior notifications from students under emergency circumstances. In some cases, official support documentation might be required for late work submission. I will review and determine if such excuse is acceptable. If such excuse is granted, emergency late submission penalties

are as followed **(1 week after due date– 10% deduction of earned grade, 2 weeks after due date – 20% deduction of earned grade). No late work will be accepted beyond 3 weeks.** Instructor reserve the right to deny late work submission under all circumstances or excuses that are deemed to be inadequate or unjustifiable.

In-Class Assignments

Hands-on activities and all in-class assignments will be assigned in each session. These assignments are designed to provide additional technical practices and exposure to programming and applying course concepts. Individual assignments will be distributed via Canvas. Group assignments sometimes will be required. Group participation and assessment are required for grading. See above section for late assignments policy.

All in-class assignments are due by the end of the session.

2. Course Projects

Projects are delivered based on requirements and instructions to build skills and improve technical competency. Individual projects or group projects must be completed and submitted by the due date. **All projects will only be accepted by the due date during the semester**, **before the closing period of the course**. **No late project submission will be allowed.**

3. Quizzes and Exams

Quizzes and Exams for this course will be available through Canvas. They are self-graded and timed, meaning you have a specific amount of time to complete them. Furthermore, once you start the quiz/exam you must complete it. You have **three attempts** to take each quiz and will receive the highest score from all the attempts.

Quizzes are due on Sunday by 11:59pm.

Final and/or midterm exam must be taken in class during the allocated time, before the course closure time. Written and/or practical exams will be monitored by instructor. Any misconduct will result in a grade of zero and/or further disciplinary action based on school policy. **No late exam will be granted.**

Grading

Your course grade will be determined according to the breakdown below and will adhere to the traditional grade distribution is as followed:
100%<A<90%, 89%<B<80%, 79%<C<70%, 69%<D<60%, and F<59%.

Homework Assignments	***15%***
Quizzes	**10%**
In-Class Assignments and Participation	**20%**
Lab Activities	**20%**
Project	**15%**
Exam	**20%**
TOTAL	**100%**

Student Code of Conduct

Overview

Willful misconduct "shall constitute good cause for discipline, including, but not limited to, the removal, suspension or expulsion of a student." The full text of the **Student Conduct Standards** and **Student Grievance Policy** can be found in the current college catalog.

Attendance and Participation

You will be required to attend class sessions as scheduled. Under emergency circumstances, you will need to send e-mail notification for your absence. **Two consecutive class absences will result in *Nonparticipation and drop* from the course. Additionally, the lack of assignment submission or participation through Canvas in two consecutive weeks or modules will result in *No-Participation and/or course drop*.** Instructor reserves the authority to determine the student attendance based on student in-class, and Canvas participation exhibiting the gain of course objectives. Course drop notification must be submitted via e-mail to the instructor **prior** to the time of drop. **All self-elected drop from course should be completed within college permitted timeline; otherwise, the student will receive the course earned grade.**

Behavioral Issues

Any behavior or conduct that cause conflict, offensive feelings or disruption will result in corrective actions, such as dismissal from class session, immediate dismissal and/or additional counseling from administrative staff, and additional actions based on the college policy.

Zero Tolerance Cheating Policy

This course is designed to evaluate your *individual abilities* to perform the tasks assigned, and therefore it is essential that you **do your own work** in this class and not share your solutions with others. Every

test or project that you submit must be performed entirely *by you and you alone*. **All assignments will be subjected to plagiarism checker tools. Do not copy-and-paste from other sources without providing proper citation and references!**

If the instructor determines that the work has been shared, plagiarized from another source, the student will be subjected to disciplinary actions in accordance to the college policy and practices. Any student caught cheating will be immediately dropped from the class in addition to counseling and disciplinary actions deemed by the college administrative staff.

If you have any questions at any time pertaining to any of these policies, please bring them to my attention.

Accessibility

To make course resource materials fully accessible to ALL students, CANVAS, e-mail and in-person submission of assignments and projects are allowed. For special accommodation request, please visit http://www.mvc.edu/services/dsps/, contact Melody at DSS in the Library Building, Room 221 or call (951) 571-6138. Refer to Student Rights and Responsibilities information on the MVC web page.

Instructor

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Office Hours – PSC-21 Room 104 (near soccer field) or in classroom (if room is available)

Monday - Thursday: 1:00 PM – 2:30 PM
By appointment: Send e-mail request at least two hours prior to arrival.
Via Skype: @professorkaseynguyen@gmail.com

Contacting Your Instructor

You can visit my office during the times listed above, if you wish to speak with me in person. If you rather communicate virtually, we could do so through e-mail for via Canvas messaging tool. Should the need arise to contact you, I will do so through the college's official email system and Canvas; therefore, you must ensure that you have access your school email account and Canvas. I will reply to all messages within 24 hours.