**COLLEGE OF ENGINEERING**

**DEPARTMENT OF COMPUTER SCIENCE**

**TENNESSEE STATE UNIVERSITY**

**COURSE DESCRIPTION FOR COMP3200 DESCRETE MATHEMATICS**

SEMESTER: Spring 2014 PROFESSOR: Dr. Wei Chen

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**A. CATALOG COURSE DESCRIPTION**

This course presents discrete mathematical structure for computer science. Topics include: logic and methods of proof, structures of sets and functions, fundamentals of algorithms, relations, permutations and combinations, discrete probability, graphs and trees and their applications, introduction to mathematical structures such as modular arithmetic, groups, ring and field. Prerequisite: Math 1910 or COMP 2140 or equivalent.

**B. COURSE OBJECTIVES**

1. Introduce students to the discrete structures in computer science (PEO#1).
2. Provide students a wide mathematical background in computer science (PEO#1).
3. Model and solve problems by applying the knowledge of discrete structure construction, mathematical reasoning, combinatorial analysis, and algorithmic thinking (PEO#1 & PEO#2).

**C. PREREQUISITIES**

Students should have a grade of ‘C’ or better in all prerequisite courses. Those who do not meet the prerequisite must withdraw from this course. No grade will be assigned for those students who do not withdraw from the course.

**D. LEARNING OUTCOMES**

Upon completion of this course with a “C” or better, the student should be:

1. Ability to organize argument and prove formula by using rules of reference and by using mathematical induction. (a)
2. Ability to select an efficient algorithm for a given problem (b, j).
3. Ability to solve basic problems in number theory (a).
4. Ability to calculate permutations, combinations, and discrete probability (a).
5. Ability to build a relation from a relationship in real world, and determine the properties of a relation (a, j).
6. Ability to use graph to represent different application problems such as computer networks (a, b, j).
7. Ability to use a tree as data structure to maintain dynamic data (a, j).
8. Ability to use discrete structures to mathematically modeling real world problems (j).

**E. DETAILED COURSE OUTLINE: COMP3200**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Date | Lecture# | Chapter # | Topics | Assignment/Due |
| 1/16 | 1 | Chapter 1 Logic | Course Introduction and syllabus |  |
| 1/16 | 2 |  | Logic: Propositions, logic operations, truth tables | A#1 |
| 1/21 | 3 |  | Prepositional equivalences |  |
| 1/23 | 4 |  | prepositional functions and quantifiers |  |
| 1/23 | 5 |  | Review 1 |  |
| 1/28 | 6 | Chapter 2  Basic structures | Sets: definitions, presentations of sets, power set, Cartesian products of sets | Due A#1  A#2 |
| 1/30 | 7 |  | Set Operations: complement, union, intersection |  |
| 1/30 | 8 |  | Functions: definition, domain, range, graphs of functions |  |
| 2/4 | 9 |  | Sequences and summations |  |
| 2/6 | 10 |  | Homework discussion | Due A#2 |
| 2/6 | 11 |  | Review 2 |  |
| 2/11 | 12 |  | Test 1 |  |
| 2/13 | 13 | Chapter 3  Algorithms, Integers, Matrices | Algorithms-I: definitions and examples |  |
| 2/13 | 14 |  | Algorithms-II: pseudocode, search algorithms | A#3 |
| 2/18 | 15 |  | Complexity of algorithms |  |
| 2/20 | 16 |  | Integers and division, Matrices |  |
| 2/20 | 17 |  | Algorithms of Integers and Matrices |  |
| 2/25 | 18 |  | Review 3 | Due A#3 |
| 2/27 | 19 | Chapter 4  Mathematics proofs | Mathematic reasoning I | A#4 |
| 2/27 | 20 |  | Mathematic reasoning II |  |
| 3/04 | 21 |  | Mathematical induction |  |
| 3/6 | 22 |  | Recursive functions and algorithms |  |
| 3/6 | 23 |  | Review4 | Due A #4 |
| 3/11 | 24 |  | Test 2 | A#5 |
| 3/13 | 25 | Chapter 5  Counting | Basic rules of counting |  |
| 3/13 | 26 |  | Permutations |  |
| 3/25 | 27 |  | Combinations |  |
| 3/27 | 28 | Chapter 6  Discrete probability | Discrete probability I |  |
| 3/27 | 29 |  | Discrete probability II |  |
| 4/1 | 31 | Chapter 8  Relations | Binary relation: definition, function as relation | Due A#5 |
| 4/3 | 32 |  | Property of binary relation: reflexive, symmetric, antisymmetric, transitive total ordering | A #6 |
| 4/3 | 33 |  | Equivalence relations, partial and total ordering |  |
| 4/8 | 34 |  | n-ary relation and application |  |
| 4/10 | 35 | Chapter 9  Graphs | Introduction to graphs, representing graphs (Adjacency lists and matrices) | Due A#6 |
| 4/10 | 36 |  | Bipartite graphs and networks, paths and connectivity | A#7 |
| 4/15 | 37 | Chapter 10  Trees | Trees: definitions, properties of trees, tree traversal |  |
| 4/17 | 38 |  | Binary search tree |  |
| 4/17 | 39 | Chapter 13  mathematic structures | Modular Arithmetic,  Groups, Ring, Field I | Due A#7  A#8 |
| 4/22 | 40 |  | Groups, Ring, Field II |  |
| 4/24 | 41 |  | Groups, Ring, Field III |  |
| 4/24 | 42 |  | Groups, Ring, Field IV |  |
| 4/29 | 43 |  | Groups, Ring, Field V |  |
| 5/1 | 44 |  | Summary of math structures |  |
| 5/1 | 45 |  | Course review and wrap up | Due A#8 |
|  |  |  | FINAL EXAM |  |

**HOMEWORKS ASSIGNMENTS (edition 6. Check course website for edition 7)**

Assignment 1

Page 16: 2, 4 a) c) e) g), 7 a) c) e) g), 10 a) c) e), 17, 20 a) b) e) f) g), 22 a) c), 28 a) c) e), 34

Page 28: 6, 10 a) b), 12

Page 46: 3 a) c), 6, 8 a) d), 10 a) c), 12 a) c) e) g), 17

Page 58: 1, 4, 8 a) c) e)

Assignment 2

Page 118: 2, 5, 6, 8, 16, 18, 22, 23

Page 130: 4, 14, 17, 26

Page 146: 2, 3a) b), 4a) c) d), 8, 10, 11, 12, 13, 18a) b) c), 26, 28

Page 160: 13, 18 a) d)

Assignment 3

Page 177: 2, 13, 14, 26

Page 191: 19, 20

Page 199: 4, 7, 8, 9

Page 208: 6, 10 a) c) e), 16,

Page 217: 4 a) b), 20 a) c), 26

Page 229: 2, 4, 26

Page 254: 1, 2, 4, 14, 29

**Solving the following problems:**

1. (a) Write an algorithm for finding the minimum in *n* integers , where  are given. The name line can be Procedure Min(int ).

(b) How many comparisons are there in your algorithm?

1. (a) Write an algorithm for calculating the summation of *n* integers  , where  are given. The name line can be Procedure Summation (int ).

(b) How many additions are there in your algorithm?

1. (a) Write an algorithm for calculating the multiplication of *n* integers  , where  are given. The name line can be Procedure Multiplication (int ).

(b) How many multiplications are there in you algorithm?

1. (a) Write an algorithm for calculating a polynomial , are given. The name line can be Procedure Poly (real ).

(b) How many additions and multiplications in your algorithm, respectively?

Assignment 4

Page 72: 4, 5, 6, 10 a) f)

Page 279: 4, 6, 9, 10, 34, 52

Page 308: 2, 4, 7, 8, 9, 23, 24 a) b)

Assignment 5

Page 344: 1, 3, 4, 6, 10, 14, 16, 22 a) b) c)

Page 360: 1, 2, 4, 5 a) b) c), 6 a) b) c), 9, 13, 15, 20

Page 398: solve the problems 1 – 9. You have to write what are the experiment, sample space and event for each problem.

Assignment 6

Page 527: 1, 2, 3, 4, 7b) c) d), 8, 28, 40, 42 a) c) d) f)

Page 562: 1, 2, 4, 21, 22

Page 578: 5, 9, 10, 14

Assignment 7

Page 595: 1, 2

Page 608: 7, 8

Page 629: 1 – 5

Page 693: 4, 10

Page 708: 1 – 5

Page 722: 8, 11, 14

Assignment 8

Question 1

1. Calculate followings without using ‘long addition’ or ‘long multiplication:
2. (5783 × 40162) mod 9
3. (5783 + 40162) mod 9
4. Without using ‘long addition’ or ‘long multiplication show that
5. 1234567 × 90123 
6. 1234567 + 90123 
7. Complete Table 1 and Table 2, the addition and multiplication tables for .

Table 1



Table 2



Question 2

1. Let Z be the set of integers, +, –, × be the addition, subtraction and multiplication on Z.
2. What is the identity in (Z, +) and (Z, –), respectively?
3. What is the inverse of 4 in (Z, +) and (Z, –), respectively?
4. Give an example show that the associativity doesn’t hold in (Z, –).
5. What is the identity in (Z, ×)? Does 4 have an inverse in (Z, ×)?
6. Let R be the set of real number. Show that (R, ×) is a group.
7. 
8. What is the identity in , respectively?
9. Does T have an inverse in ?
10. Does F have an inverse in ?

Question 3 Show thatis a ring by showing

a) is a commutative group.

b) satisfies with the conditions of closure, identity and associativity.

c) Matrix operation + and ×satisfy with distributive law.

Question 4 Why is not a field, i.e., what condition it doesn’t satisfy with?



1. **GENERAL INFORMATION**

**Number of Credit Hours:** 3

**Text Book**

Title: Discrete Mathematics and Its Applications, 6th edition or 7th edition

Authors: Kenneth H. Rosen

Publisher: McGraw-Hill

**Reference Book:**

Title: Cryptography Network Security

(Section 2.2 Modular arithmetic, Section 4.1 Algebraic structures)

Authors: Behrouz A. Forouzan

Publisher: McGraw-Hill

**Class Days & Time:** TR 9:40am – 11:05, R 8:30am – 11:05am

**Instructor’s Information:**

Telephone: 963-5878

Email: [wchen@tnstate.edu](mailto:wchen@tnstate.edu) URL: http://www.tnstate.edu/faculty/wchen

Office: MH Room 5N

Office hours:MW 1pm – 3pm TR 11:10pm – 12:40 pm, 2:30 pm – 3:00 pm

**G. CLASS ATTENDENCE**

Class attendance is required. The university’s policy on excessive absences will be followed. All students are requested to review more than four classes will be dropped from the class. Students are responsible for all assignments, announcements, and materials presented during the class.

**H. EVALUATION & GRADING**

There will be two scores for two written pre-final tests, a score for homework assignments, a score for quizzes and one score for the final test. Weights (percentages) for different scores will be as follows.

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | **Grading:** |  |
| **Assignments** | 30% | 90-100% | A |
| **Quizzes** | 10% | 80-89% | B |
| **Test 1** | 15% | 70-79% | C |
| **Test 2** | 20% | 60-69% | D |
| **Final test** | 25% | Below 60% | F |

1. I. IMPORTANT NOTES
2. Textbook is an essential part of the course and therefore, every student must buy and read the textbook. Some of the homework assignments will be selected from the textbook.
3. Every student has to preview the lecture note and bring it coming to the class (the lecture notes can be download from [www.tnstate.edu/wchen](http://www.tnstate.edu/wchen)).
4. Class roll will be taken at the beginning of the class period. The students that come after the process of taking roll is over will be recorded as absent.
5. Excuses regarding missed classes such as a doctor’s appointment or death in the family must show evidence such as a doctor’s excuse or obituary as soon as possible before or after the incident. If the absence is anticipated, such as a job interview, the student must notify the instructor in advance.
6. Cellular Phones must be turned off during the class period.
7. POLICY ON EXCESSIVE ABSENCES: The Policy on Excessive Absences as printed in the Undergraduate Catalog will be followed. Student missing more than three (3) lectures or being too late may be dropped from the class without prior notice.
8. An ample number of homework assignments will be given. Correct answers and explanation of the assignments will be given after the due days. Therefore, all assignments are due on, or before, the due date and time. Assignments will not be accepted at all after the due date & time; not even with an official excuse.
9. Homework assignments can be worked out individually or collectively in small groups. However, copying other students’ work is absolutely prohibited.
10. Written assignments must be submitted in readable and clean forms. NO CREDIT will be given for a non-readable work.
11. No test will be repeated for students who miss tests, no matter what is the reason. However, if a student misses a test for a reason accepted and certified, then score of the following test will be recorded for the score of the missing test.
12. Any student found cheating on any test or assignment will automatically receive a grade of 0 (F) for the course.
13. No grade of I (Incomplete) will be given, unless the university policy admits it.
14. Instructor reserves the right to modify the score weights