COURSE OUTLINE OF RECORD

Number: MATH A230 **TITLE:** Introduction to Discrete Mathematics

ORIGINATOR: Tab Livingston **EFF TERM:** Fall 2016

FORMERLY KNOWN AS: **DATE OF OUTLINE/REVIEW:** 12-02-2015

CROSS LISTED COURSE: **TOP NO:** 1701.00

CID:

SEMESTER UNITS: 5.0

HRS LEC: 90.0 **HRS LAB:** 0.0 **HRS OTHER:** 0.0

CONTACT HRS TOTAL: 90.0

STUDY/NON-CONTACT HRS RECOMMENDED: 180.0

CATALOG DESCRIPTION:

Introduction to logic, sets, relations, algorithms, number theory, combinatorics, graphs, trees and Boolean algebra. May be taken for grades or on a pass-no pass basis. Transfer Credit: CSU; UC.

JUSTIFICATION FOR COURSE:

Comparable to a lower division transfer course at UC and CSU.

PREREQUISITES:

- Appropriate OCC Math Placement Score.
  or
- MATH A185: Calculus 2 with a minimum grade of C or better
  or
- MATH A185H: Calculus 2 Honors with a minimum grade of C or better
  or
- MATH A182H: Calculus 1 and 2 Honors with a minimum grade of C or better

COREQUISITES:

ADVISORIES:

ASSIGNED DISCIPLINES:

Mathematics

MATERIAL FEE: Yes [ ] No [X] Amount: $0.00

CREDIT STATUS: Noncredit [ ] Credit - Degree Applicable [X] Credit - Not Degree Applicable [ ]

GRADING POLICY: Pass/No Pass [X] Standard Letter [X] Not Graded [ ]

OPEN ENTRY/OPEN EXIT: Yes [ ] No [X]

TRANSFER STATUS: CSU Transferable[ ] UC/CSU Transferable[X] Not Transferable[ ]

BASIC SKILLS STATUS: Yes [ ] No [X] **LEVELS BELOW TRANSFER:** Not Applicable

CALIFORNIA CLASSIFICATION CODES: Y - Not Applicable

NON CREDIT COURSE CATEGORY: Y - Not applicable, Credit Course

OCCUPATIONAL (SAM) CODE: E

REPEATABLE ACCORDING TO STATE GUIDELINES: No [X] Yes [ ] NUMBER REPEATS:

REQUIRED FOR DEGREE OR CERTIFICATE: No [ ] Yes [X]
COMPUTER PROGRAMMING(Associate in Science)
COMPUTER PROGRAMMING(Certificate of Achievement)

GE AND TRANSFER REQUIREMENTS MET:

IGETC Area 2: Mathematical Concepts and Quantitative Reasoning

2A: Mathematic

CSU GE Area B: Scientific Inquiry and Quantitative Reasoning

B4 - Mathematics/Quantitative Thinking

OCC AA Gen Ed

AREA A2: LANGUAGE AND RATIONALITY - Communication and Analytical Thinking

OCC AS Gen Ed

AREA A2 – ENGLISH COMMUNICATION - Communication and Analytical Thinking

COURSE LEVEL STUDENT LEARNING OUTCOME(S) Supported by this course:

1. Recognize and use basic logic notation.
2. Find GCD's and LCM's.
3. Find the shortest path of a graph.
4. Prove logical equivalency of two propositions.
5. Identify Prime and Composite numbers.

COURSE OBJECTIVES:

1. Use basic logic notation.
2. Prove that two propositions are logically equivalent.
3. Denote statements in basic set notation.
4. Identify functions and relations.
5. Use the concepts of injectivity, surjectivity and bijectivity.
6. Analyze equivalence relations (including congruence classes mod n).
7. Use the Euclidean algorithm to find GCDs and LCMs.
8. Use the Fundamental Theorem of Arithmetic.
9. Identify prime and composite numbers.
10. Create proofs using mathematical induction.
11. Use combinatorial counting techniques such as permutations, combinations, multinomial coefficients and the Pigeonhole Principle.
12. Solve advanced counting problems by constructing and solving recurrence relations.
13. Find Euler and Hamiltonian paths and circuits for graphs.
14. Find the shortest path of a graph.
15. Prove that two graphs are isomorphic.
16. Identify planar graphs.
17. Identify trees, spanning trees, minimal spanning trees and binary trees.
18. Prove that two trees are isomorphic.
19. Use Boolean algebra notation.
20. Create combinatorial circuits and their logic tables.
21. Minimize combinatorial circuits.

COURSE CONTENT:

LECTURE CONTENT:

It is understood that instructors will present some proofs of major laws, theorems and algorithms. The instructor will choose which proof to present and discuss. Recommended time for each topic is shown in the outline below, based on a 16 week format, and allowing 1.5 weeks for exams.

A. Logic
   1. Notation
   2. Propositions (AND, OR, NOT, IF/THEN, DeMorgan's Laws, Biconditionals, Converse and Contrapositive)

3. Logical Equivalence
4. Quantifiers
5. Analyze prepositional statements with logic tables
6. Mathematical induction

B. Sets
1. Basic definitions and notation
2. Laws of sets such as associative, identity, absorption and DeMorgan's
3. Venn Diagrams
4. Subsets
5. Cartesian products
6. Cardinality
7. Partially ordered sets and lattices

C. Relations
1. Functions (domain and range)
2. Relations
3. Recurrence relations
4. Digraphs
5. Injectivity, surjectivity and bijectivity of functions
6. Reflexivity, Symmetry and Transitivity
7. Equivalence Relations including equivalence classes of a set and congruence classes mod n (proofs)

D. Intro to Number Theory (The Euclidean Algorithm)
1. Euclidean Algorithm
2. GCD and LCM
3. Prime and composite numbers
4. Relatively prime
5. Fundamental Theorem of Arithmetic
6. Use of mathematical induction in proofs

E. Combinatorics
1. Product Rule
2. Permutations
3. Combinations
4. Counting problems involving multinomial coefficients
5. Advanced counting situations involving construction and solution of recurrence relations
6. Pigeonhole Principle
7. Applications of finite probabilities (lottery, buckets of balls, etc.)

F. Graphs
1. Basic terminology, paths and circuits, subgraphs
2. Euler paths and circuits (Fleury's Algorithm)
3. Hamiltonian paths and circuits
4. Shortest path (Dijkstra's Shortest Path Algorithm)
5. Adjacency matrices
6. Isomorphisms of graphs
7. Planar graphs

G. Trees
1. Terminology and characterizations of trees
2. Spanning trees and minimal spanning trees (Kruskal's Algorithm and Prim's Algorithm)
3. Binary trees
4. Isomorphisms of trees

H. Boolean Algebra
1. Combinatorial circuits (AND, OR, NOT, NOR and NAND gates)
2. Logic tables for combinatorial circuits
3. Boolean algebras
4. Minimizing combinatorial circuits (including Karnaugh Maps)

LABORATORY CONTENT:

METHODS OF INSTRUCTION:

A. Lecture:
B. Independent Study:

INSTRUCTIONAL TECHNIQUES:

Lecture, written homework, discussion.

COURSE ASSIGNMENTS:

Out-of-class Assignments

Students will spend approximately 8 hours per week on out-of-class assignments, including reading, writing, and assigned exercises for practice.

Writing Assignments

Students will spend approximately 1 hour per week on writing assignments.

Reading Assignments

Students will spend approximately 1 hour per week reading from assigned text.

METHODS OF STUDENT EVALUATION:

Midterm Exam
Final Exam
Short Quizzes
Written Assignments

Demonstration of Critical Thinking:

Several unit written exams and comprehensive final.

Required Writing, Problem Solving, Skills Demonstration:

Several unit written exams and comprehensive final.

TEXTS, READINGS, AND RESOURCES:

TextBooks:

1. Rosen, Kenneth H. . *Discrete Mathematics and its Applications* , 7TH ed. New York: McGraw Hill, 2011

Other:

1. Other appropriate textbook as chosen by faculty.

LIBRARY:

Adequate library resources include: Print Materials
Non-Print Materials
Online Materials
Services

Comments:

Attachments:

Attached Files