COURSE OUTLINE OF RECORD

Number: MATH A220   **TITLE:** Introduction to Symbolic Logic

ORIGINATOR: Tab Livingston   **EFF TERM:** Fall 2015

FORMERLY KNOWN AS: **DATE OF OUTLINE/REVIEW:** 03-02-2016

CROSS LISTED COURSE: PHIL A220   **TOP NO:** 1509.00

                                                            CID:

SEMESTER UNITS: 3.0

HRS LEC: 54.0   **HRS LAB:** 0.0   **HRS OTHER:** 0.0

CONTACT HRS TOTAL: 54.0

STUDY/NON-CONTACT HRS RECOMMENDED: 108.0

CATALOG DESCRIPTION:

Students learn to translate simple, quantified, and multiply-quantified English sentences into symbolic form in both sentence logic and predicate logic with quantifiers. Truth tables are used to both classify and compare symbolic sentence's properties. Proof techniques for determining validity or invalidity of arguments containing simple sentences, compound sentences, and sentences containing quantifiers in sentence and predicate logic systems are learned including truth tables, truth trees, and natural deduction style proofs with inference, replacement and quantifier rules. Same as Math A220. Students completing Philosophy A220 may not receive credit for Math A220. May be taken for grades or on a pass-no pass basis. Transfer Credit: CSU; UC.

JUSTIFICATION FOR COURSE:

Comparable to a lower division UC or CSU course.

PREREQUISITES:

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 [X] Yes [ ]

GE AND TRANSFER REQUIREMENTS MET:

 CSU GE Area A: Communication in the English Language and Critical Thinking
        A3 - Critical Thinking

 CSU GE Area C: Arts, Literature, Philosophy and Foreign Languages
        C2 - Humanities

 OCC AS Gen Ed
        AREA A2 – ENGLISH COMMUNICATION - Communication and Analytical Thinking
        AREA C2: ARTS AND HUMANITIES - Humanitites

MATH A220-Introduction to Symbolic Logic

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

1. Students will be able to translate from English into either sentence or predicate logic and use proof techniques, including natural deduction style proofs, to derive valid conclusions in both sentence logic and predicate logic with quantifiers.

2. Students will be able to critically evaluate, assess and present types and properties of arguments and use logical techniques to determine and justify their structural features and claims.

COURSE OBJECTIVES:

1. Write English declarative sentences (simple, quantified, multiply-quantified) in symbolic form.

2. Define (in)validity, soundness, tautology, contradictory, contingency and equivalence.

3. Construct proofs that determine the validity and invalidity of arguments in sentence logic using truth tree proofs.

4. Construct truth tables to determine the validity of symbolic and English arguments involving truth-functional logic.

5. Write the standard rules of inference and replacement.

6. State two contrasts in the structures of rules of inference and replacement.

7. Construct direct proofs for symbolic and English arguments involving simple statements.

8. Construct conditional proofs for symbolic and English arguments involving simple statements.

9. Construct indirect proofs for symbolic and English arguments involving simple statements.

10. Construct direct, conditional, and indirect proofs for symbolic and English arguments involving simple, singly quantified and multiply-quantified statements.

11. Construct conditional and indirect proofs for symbolic tautologies involving singly quantified and multiply-quantified statements.

COURSE CONTENT:

LECTURE CONTENT:

A. Determine the validity of arguments composed of simple sentences
1. Translate declarative English sentences into symbolic form
2. Define basic terminology regarding statements and arguments
3. Use truth tables to
a. determine the truth value of a symbolic statement
b. characterize symbolic statements as
i. tautologies
ii. contradictions
iii. contingencies
iv. equivalences
c. verify the validity of the rules of inference
d. determine the validity of symbolic and English arguments
B. Understand the concept of, and criteria of, validity
C. Construct proofs for arguments composed of simple sentences
1. Demonstrate familiarity with logic rules
a. state basic inference and replacement rules
b. contrast the structure of inference and replacement rules
c. verify the validity of the inference rules by truth table
2. Supply reasons for each line of a given proof segment
3. Apply methods of proof to symbolic and English arguments
a. direct proof
b. conditional proof
c. indirect proof
4. Use an indirect truth table to
a. determine the validity of symbolic and English arguments
b. verify any of the replacement rules are tautologies

    D. Construct proofs that determine the validity and invalidity of arguments in sentence logic using truth tree proofs

    E. Determine the validity of arguments and prove arguments involving single quantification
       1. Translate English sentences to symbolic form
       2. Use truth tables on symbolic and English arguments to
          a. verify invalidity
          b. determine validity
       3. Prove symbolic and English arguments

    F. Prove arguments involving multiple quantification
       1. Translate English statements involving multiple quantification to symbolic form
       2. Use the multiple quantifier inference rules
          a. state the rules of instanciation and generalization
          b. state the rules of quantifier negation
          c. identify correct use of quantifier rules in proof segments
          d. identify quantification errors in proof segments
       3. Prove symbolic and English arguments containing multiple quantification
       4. Prove symbolic tautologies containing multiple quantification

LABORATORY CONTENT:

METHODS OF INSTRUCTION:

  A. Lecture:
  B. Independent Study:

INSTRUCTIONAL TECHNIQUES:

Lecture, written homework, discussion, peer feedback.

COURSE ASSIGNMENTS:

  Reading Assignments

  From assigned text, 1 hour

  Out-of-class Assignments

  Homework including writing out truth tables and various types of logical proofs. 4 hours

  Writing Assignments

  Tests include writing out truth tables and various types of logical proofs. 1 hour

METHODS OF STUDENT EVALUATION:

Midterm Exam
Final Exam
Short Quizzes
Objective Examinations

  Demonstration of Critical Thinking:

  Comparison of student achievement with minimum standards on several written tests and final exam.

  Required Writing, Problem Solving, Skills Demonstration:

  Assessment of written truth tables and logical proofs, which will evaluate the student's problem-solving and critical-thinking abilities.

TEXTS, READINGS, AND RESOURCES:

  TextBooks:

  1. Hurley, Patrick J. *A Concise Introduction to Logic*, 12th ed. Stamford: Cengage Learning, 2014

  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