

Course Outline of Record

Los Medanos College

2700 East Leland Road

Pittsburg CA 94565

Course Title: Symbolic Logic

Subject Area/Course Number: Philosophy 210

New Course OR Existing Course

Author(s): Edward Fielder Haven

Subject Area/Course No.: Philosophy 210

Units: 3

Course Title: Symbolic Logic

Discipline(s): Philosophy, Mathematics, Computer Science

Pre-Requisite(s): None

Co-Requisite(s): None

Advisories: Eligibility for Math-34 or Completion of Phil-110

Catalog Description:

This course introduces students to symbolic logic, through the study of propositional logic (the logic of sentences) and predicate logic (the logic of classes and relations). This will include, symbolizing sentences, semantic methods such as truth tables, syntactic methods such as proofs and an introduction of metalogic.

Schedule Description:

This course introduces students to symbolic logic and the core logic behind, mathematics, computers, scientific reasoning and more. This will include, symbolizing sentences, semantic methods such as truth tables and syntactic methods such as proofs. Students will be challenged to explore how and why logic operates the way it does and be introduced to metalogic questions and considerations. This course is recommended for students in the sciences, computer programming, mathematics, linguistics, law, and philosophy.

Hrs/Mode of Instruction: Lecture: _54_ Scheduled Lab: ___ HBA Lab: ___ Composition: ___ Activity: ___ Total Hours _54_

Credit Credit Degree Applicable (DA)
 Credit Non-Degree (NDA)

Grading Pass/No Pass (P/NP)
 Letter (LR)
 Student Choice (SC)

Repeatability 0
 1
 2
 3

Last date of Assessment: _____

Cohort #: _1_

Please apply for:

LMC General Education Requirement(s): _____

Transfer to: CSU UC IGETC Area __3B__ CSU GE Area __3A__ C-ID Number __PHIL 210__

Course is Baccalaureate Level: Yes No

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Signatures:

Department Chair _____ Date _____
Librarian _____ Date _____
Dean (Technical Review) _____ Date _____
Curriculum Committee Chair _____ Date _____
President/Designee _____ Date _____
CCCCD Approval Date (Board or Chancellor's Office) _____ Date _____

STAND ALONE COURSE: YES X NO

Course approved by Curriculum Committee as Baccalaureate Level: YES NO

LMC GE Requirement Approved by the Curriculum Committee: _____

FOR OFFICE OF INSTRUCTION ONLY. DO NOT WRITE IN THE SECTION BELOW.

Begin in Semester SU17 Catalog year 2017____/2018____ Class Max: 40
Dept. Code/Name: L5014-PHIL T.O.P.s Code: 1509.00 Crossover course 1/ 2: _____
ESL Class: Yes / (No) DSPS Class: Yes / (No) Coop Work Exp: Yes / (No)

- Class Code A Liberal Arts & Sciences SAM Code A Apprenticeship Remediation Level B Basic Skills
 B Developmental Preparatory B Advanced Occupational NBS Not Basic Skills
 C Adult/Secondary Basic Education C Clearly Occupational
 D Personal Development/Survival D Possibly Occupational
 E For Substantially Handicapped E* Non-Occupational
 F Parenting/Family Support
 G Community/Civic Development *Additional criteria needed
 H General and Cultural 1 One level below transfer
 I Career/Technical Education 2 Two levels below transfer
 J Workforce Preparation Enhanced 3 Three levels below transfer
 K Other non-credit enhanced
 Not eligible for enhanced

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Institutional Student Learning Outcomes:



General Education SLOs:

At the completion of the LMC general education program, a student will:

1. read critically and communicate effectively as a writer and speaker.
2. understand connections among disciplines and apply interdisciplinary approaches to problem solving.
3. think critically and creatively
4. consider the ethical implications inherent in knowledge, decision-making and action.
5. possess a worldview informed by diverse social, multicultural and global perspectives.



None

Program-Level Student Learning Outcomes (PSLOs):

Proposed Program-Level Student Learning Outcomes

1. Citizenship – Developing and applying ethical responsibility and care in academics, the workplace, and global and local communities, while respecting and engaging with a diversity of beliefs, cultures, values, abilities, genders, races, ages, and sexual orientations.
2. Critical Engagement – Becoming critical co-investigators of a pluralistic world towards the agency to apply critical thinking to themselves, their communities and their societies, imparting an ethical imperative.
3. Philosophical Enquiry – Applying the methodologies of philosophy and critical thinking to describe and analyze philosophical and interdisciplinary problems and issues, including in historical context.
4. Philosophical Expression – Express complex philosophical ideas and arguments in clear, coherent and cogent written and oral communication.

Course-Level Student Learning Outcomes (CSLOs):

1. Understand core metalogic terms and concepts, including deduction, validity, soundness and completeness, towards introducing the basic construction of logical systems. (PSLO 2, 3, 4)
2. Use symbolization, semantic and syntactic methods for assessing validity in propositional logic. (PSLO 2, 3, 4)
3. Use symbolization, semantic and syntactic methods for assessing validity in quantified predicate logic. (PSLO 2, 3, 4)
4. Respect and appreciate deductive methods, such as proofs, as a tool for solving interdisciplinary and transcultural problems. (PSLO 1, 2, 3, 4)

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Assessment Instruments:

Through the course of the semester students will receive both formative and summative assessments, to evaluate their progress towards mastery of the student learning outcomes. Assessments may take on many forms, but will focus on critical engagement with the material in the course, student comprehension of the underlying interconnected philosophical issues and their ability to operate within the logical systems by proving validity.

	<u>Problem Sets</u>	<u>Tests</u>	<u>Oral Demonstrations</u>
CSLO 1	X	X	
CSLO 2	X	X	X
CSLO 3	X	X	X
CSLO 4	X		X

1. Understand core metalogic terms and concepts, including deduction, validity, soundness and completeness, towards introducing the basic construction of logical systems. (PSLO 2, 3, 4)

Problem Sets

Students will complete problem sets in order to master key logical terms and concepts, through identification and description.

Tests

Students will be tested on the definitions and uses of key logical terms and concepts.

Sample Assignment

Test questions:

Match the following terms with the correct definition

1. Claim	a. If the premises are true, then the conclusion cannot be false.
2. Validity	b. The conclusion follows from a matter of logical necessity.
3. Deductive Logic	c. A statement which can be true or false
4. Argument	d. A claim supported by other claims

2. Use symbolization, semantic and syntactic methods for assessing validity in propositional logic. (PSLO 2, 3, 4)

Problem Sets

Practice of logical skills and methods is a necessary part of mastery of propositional logic. In order to facilitate this students will complete problem sets for homework which will provide them with the necessary practice to succeed.

Tests

Students will receive a test specifically to test the developed propositional logic skills.

Oral Demonstrations

Students will be asked to orally present solutions to problems and provide instruction to their fellow classmates in the completion of such problems.

Sample Problems from Assignments:

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1. For the following arguments provide proofs

a. $(a \vee b) \rightarrow c, a \therefore c$

b. $\sim b \rightarrow (c * t), \sim t \therefore b$

c. $t \rightarrow (s * j), t \therefore j$

2. Determine if the following arguments are valid using a truth table:

a. $(p \rightarrow q) \rightarrow r, p \therefore r$

b. $(p * q) \rightarrow r, p \therefore r$

c. $(p \vee q) \rightarrow r, p \therefore r$

3. Use symbolization, semantic and syntactic methods for assessing validity in quantified predicate logic. (PSLO 2, 3, 4)

Problem Sets

Practice of logical skills and methods is a necessary part of mastery of quantified predicate logic. In order to facilitate this students will complete problem sets for homework which will provide them with the necessary practice to succeed.

Tests

Students will receive a test specifically to test the developed quantified predicate logic skills.

Oral Demonstrations

Students will be asked to orally present solutions to problems and provide instruction to their fellow classmates in the completion of such problems.

Sample Problems from Assignments:

2. Determine if the following statements are well formed formulas (wffs)

a. $\exists x \exists y (Gx \rightarrow Fy)$

b. $\exists x (Gy * Fx)$

2. Translate each English-language sentence into QL (from Forallx)

a. Amos, Bouncer, and Cleo all live at the zoo.

b. Bouncer is a reptile, but not an alligator.

c. If Cleo loves Bouncer, the Bouncer is a monkey.

d. If both Bouncer and Cleo are alligators, then Amos loves them both.

4. Respect and appreciate deductive methods, such as proofs, as a tool for solving interdisciplinary and transcultural problems. (PSLO 1, 2, 3, 4)

Problem Sets

Where appropriate, problem sets will demonstrate the use of symbolic logic in other fields which are transcultural, such as computer science or mathematics.

Oral Demonstrations

Oral presentations on the application of symbolic logical problems in science, technology, engineering or math will be used to assess students' comprehension of the interdisciplinary nature of logic.

Sample Assignment:

Problem Set:

When building a search page, like Google, there are lots of different features that want to be on the page and many rules to govern what makes it on to the page you see. A few example rules are:

Exclusivity: $\text{not}(A \text{ and } B)$. e.g. don't show maps and weather on the same page.

Trumping: $(A \Rightarrow \text{not}(B))$. e.g. if we can show an info card for a person, don't show information pulled from web pages.

Dependencies: $(A \Rightarrow B)$ e.g. if we have a location info card then also show a map to that location.

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That's pretty abstract and we need to respect the relative quality of the links, so how we pack a page of results is to start with the highest result and apply qualified rules as we examine each feature.

Write rules for the following (including a key for all data types):

1. When searching for a location a map is included.
2. When searching for a location a map is included but not if it is a fictional or historic location.
3. Map + Images + Travel trumps a basic card
4. Map + Images + Travel depends on having map data, images data and travel data.
5. All cards should be shown before links.

6. A knowledge card should be shown instead of a basic card.

Method of Evaluation/Grading:

Through the course of the semester students will receive both formative and summative assessments, to evaluate their progress towards mastery of the student learning outcomes. Assessments may take on many forms, but will focus on critical engagement with the material in the course, student comprehension of the underlying interconnected philosophical concepts and their ability to operate within the logical systems by proving validity. The course will work on practicing the basic skills of logical operations through problem sets assigned at least weekly, building to section tests in which students will demonstrate mastery of the material. The course will culminate with a cumulative final.

A sample break down of grade weight by approximate percentage value could be:

Tests (3 Tests)	45%
Final Test	30%
Problem Sets	20%
Oral Demonstrations	5%

A student who earns an 'A' grade will have achieved mastery in the course-level learning outcomes, demonstrating exceptional ability for critical engagement with the material in the course, student comprehension of the underlying philosophical skills, abilities and tools at the foundation of critical thinking/composition and their ability to operate within the logical systems by proving validity.

A student who earns a 'B' grade will have achieved near mastery or mastery in some but not all of the course-level learning outcomes, demonstrating a strong ability for critical engagement with the material in the course, student comprehension of the underlying philosophical skills, abilities and tools at the foundation of critical thinking/composition and their ability to operate within the logical systems by proving validity.

A Student who earns a 'C' grade will have achieved a satisfactory completion of the course-level learning outcomes, demonstrating satisfactory ability for critical engagement with the material in the course, student comprehension of the underlying philosophical skills, abilities and tools at the foundation of critical thinking/composition and their ability to operate within the logical systems by proving validity.

A student who earns a 'D' grade will have achieved near satisfactory completion or satisfactory completion in some but not all of the course-level learning outcomes, demonstrating below standard ability for critical engagement with the material in the course, student comprehension of the underlying philosophical skills, abilities and tools at the foundation of critical thinking/composition and their ability to operate within the logical systems by proving validity.

A student who earns a 'F' grade will lack satisfactory completion of the course-level learning outcomes, demonstrating a deficiency in ability for critical engagement with the material in the course, student comprehension of the underlying philosophical skills, abilities and tools at the foundation of critical thinking/composition and their ability to operate within the logical systems by proving validity.

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Course Content:

The course will cover sentential and predicate logic. For each logic the course will cover how to symbolize English sentences, a semantic interpretation method and a syntactic interpretation method. The course will include a larger meta-logical conversation about the structure of logical systems.

Sample outline:

- I. What is logic?
 - A. Arguments and Sentences
 - B. Deductive Arguments
 - C. Validity, Soundness and Completeness
- II. Sentential Logic
 - A. Sentence letters and Connectives
 - B. Well Formed Formulas
- III. Truth Tables
 - A. Truth-functions
 - B. Complete truth tables
 - C. Partial truth tables
- IV. Proofs for Sentential Logic
 - A. Basic Rules
 - B. Derived Rules
 - C. Rules of Replacement
 - D. Indirect Proofs
 1. Reductio Ad Absurdum
 2. Conditional
- V. Quantified Logic
 - A. Sentence letters and Connectives
 - B. Well Formed Formulas
- VI. Interpretation and Models
- VII. Proofs for Quantified Logic
 - A. Basic Rules
 - B. Rules for identity
 - C. Strategies
 - D. Axioms
- VIII. Metalogic

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Lab By Arrangement Activities (If Applicable):n/a

Instructional Methods:

- Lecture
- Lab
- Activity
- Problem-based Learning/Case Studies
- Collaborative Learning/Peer Review
- Demonstration/Modeling
- Role-Playing
- Discussion
- Computer Assisted Instruction
- Other (explain) _____

Textbooks:

Sample Textbooks include:

1. Selections from primary sources (Open Educational Resources)
2. P.D. Magns, (2014) Forallx An Introduction to Formal Logic (online)
3. Carnap, Rudolf (2011) Introduction to Symbolic Logic and Its applications. Dover Publications
4. R. M. Martin, Introducing Symbolic Logic
5. M Bergmann, J Moor, J Nelson, (2013) The Logic Book (6th Ed.) McGraw-Hill Education