School of Computing and Information Sciences

Course Title: Logic for Computer Science **Date:** 3/20/10

Course Number: COT-3420

Number of Credits: 3

Subject Area: Foundations	**Subject Area Coordinator:** Geoffrey Smith **email:** smithg@cis.fiu.edu
Catalog Description: An introduction to the logical concepts and computational aspects of propositional and predicate logic, as well as to concepts and techniques underlying logic programming, in particular, the computer language Prolog.	
Textbook: Russel and Norwig, *Artificial Intelligence: A Modern Approach,* Second Edition, Prentice Hall, 2003, ISBN: 978-0137903955	
References: Uwe Schoening, Logic for Computer Scientists, Birkhaeuser Verlag, 1989. Ivan Bratko, *Prolog - Programming for Artificial Intelligence,* Addison Wesley Publ. Co., 2000	
Prerequisite Courses: COP 3337 (Programming II) and MAD 2104 (Discrete Mathematics)	
Corequisite Courses: None	

Type: Required for CS Major

Prerequisites Topics:

- Familiarity with programming in Java or C++.
- Familiarity with definitions and theorems involving sets, relations, and functions.
- Familiarity with propositional logic.
- Familiarity with mathematical induction and recursion.

Course Outcomes:

1. Become familiar with the concepts, methods, and results of first-order logics.
2. Master formal proofs, both syntactic and semantic.
3. Master specifying problems as first-order logic formulas.
4. Become familiar with the application of logic to logic programming, in particular, be able to write and debug small Prolog programs.

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Relationship between Course Outcomes and Program Outcomes

BS in CS: Program Outcomes	Course Outcomes
a) Demonstrate proficiency in the foundation areas of Computer Science including mathematics, discrete structures, logic and the theory of algorithms	1, 2, 3
b) Demonstrate proficiency in various areas of Computer Science including data structures and algorithms, concepts of programming languages and computer systems.	4
c) Demonstrate proficiency in problem solving and application of software engineering techniques	4
d) Demonstrate mastery of at least one modern programming language and proficiency in at least one other.	4
e) Demonstrate understanding of the social and ethical concerns of the practicing computer scientist.	
f) Demonstrate the ability to work cooperatively in teams.	
g) Demonstrate effective communication skills.	

Assessment Plan for the Course & how Data in the Course are used to assess Program Outcomes

Student and Instructor Course Outcome Surveys are administered at the conclusion of each offering, and are evaluated as described in the School's Assessment Plan: http://www.cis.fiu.edu/programs/undergrad/cs/assessment/

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Outline

Topic	Number of Lecture Hours	Outcome
1. Propositional Logic	12 - 14	1, 2
1.1. Syntax	2	1
1.2. Structural Induction	2–3	2
1.3. Semantics	2	1, 2
1.4. Conjunctive Normal Form	2	1
1.5. Resolution	2 - 3	1, 2
1.6. Soundness and Completeness	2	1
2. First-Order Logic	14 - 17	1, 2, 3
2.1. Syntax	2	1
2.2. Semantics	2 - 3	1, 2
2.3. Conjunctive Normal Form	3	1, 3
2.4. Resolution	3	1, 2
2.5. Examples of resolution proofs	2 - 3	2, 3
2.6. Soundness and Completeness	2 – 3	1, 2
3. Logic Programming and Prolog	9 - 12	3, 4
3.1. What is logic programming?	1	3, 4
3.2. Prolog: facts and rules	2	3, 4
3.3. Resolution in Prolog	2 - 3	3, 4
3.4. Lists in Prolog	2 - 3	3, 4
3.5. Applications	2 - 3	3, 4

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Course Outcomes Emphasized in Laboratory Projects / Assignments

Outcome	Number of Weeks
1	9
2	9
3	7
4	6

Oral and Written Communication

No significant coverage

Written Reports		Oral Presentations	
Number Required	Approx. Number of pages	Number Required	Approx. Time for each
0	0	0	0

Social and Ethical Implications of Computing Topics

No significant coverage

Topic	Class time	student performance measures

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Approximate number of credit hours devoted to fundamental CS topics

Fundamental CS Area	Core Hours	Advanced Hours
Algorithms:	**0.4**	
Software Design:		
Computer Organization and Architecture:		
Data Structures:	**0.3**	
Concepts of Programming Languages	**0.3**	

Theoretical Contents

Topic	Class time
Mathematical logic	30 hours

Problem Analysis Experiences

Solution Design Experiences

Design of some small Prolog programs

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The Coverage of Knowledge Units within Computer Science Body of Knowledge[1]

Knowledge Unit	Topic	Lecture Hours
DS2. Basic logic	1,2	10
DS3. Proof techniques	1,2	6
PF4. Recursion	3	2
IS3. Knowledge representation and reasoning	3	6

[1]See http://www.computer.org/education/cc2001/final/chapter05.htm for a description of Computer Science Knowledge units