

BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE, PILANI
Hyderabad campus
INSTRUCTION DIVISION
FIRST SEMESTER 2011-2012
COURSE HANDOUT (PART II)

Date: 03/08/2012

In addition to Part I (General Handout for all courses appended to the timetable) this portion gives further specific details regarding the course.

Course No. : CS F214/IS F214
Course Title : Logic in Computer Science
Instructor-in-Charge : Chennupati R Prasanna

1. Scope and objective of the course:

Logic plays a fundamental role in computer science. The objective of the course is to present the fundamental basic notions of logic that are important in computer science. The course covers topics in propositional logic – syntax, semantics, satisfiability & validity, predicate or first order logic – syntax, semantics, satisfiability & validity, completeness & compactness, Undecidability & incompleteness. The course also deals with verification by model checking, linear-time temporal logic (LTL), & computational tree logic (CTL). Program verification using Hoare logic & proofs of correctness. Modal logic & logic programming are also introduced.

2. Text Books:

1. Huth, Michael, and Ryan, Mark, *Logic in Computer Science*, 2e, Cambridge University Press, 2004.

Reference Books

1. Ben-Ari, Mordechai, *Mathematical Logic for Computer Science*, 2e, Springer, 2003.
2. Enderton, Herbert B. *A Mathematical Introduction to Logic*, 2e, Academic Press, 2001.
3. John Kelly, *The Essence of Logic*, Prentice-Hall India, Eastern Economy Edition, 1997.
4. I. M. Copi, *Symbolic Logic*, Prentice-Hall India, reprint of 1979 edition by Macmillan.
5. Clocksin-mellish, *programming in prolog*, 5e, Springer, 2003.

3. Course Plan

Lecture #	Lecture Objectives	Topics	Reference
1-3	To introduce the concepts of logic and to understand its role in computer science	<ul style="list-style-type: none"> • Course overview • Introduction to logic • Introduction to propositional & predicate logic 	R1: Ch. 1
4-10	To understand propositional logic & its syntax & semantics	<ul style="list-style-type: none"> • Declarative sentences • Deductive systems • Propositional logic as a formal language • Semantics • Normal forms 	Ch. 1 R1: Chs. 2-4
11-20	To understand the need for a richer logic – predicate logic	<ul style="list-style-type: none"> • Limitations of propositional logic • Predicate logic as a formal language • Proof theory 	Ch. 2 R1: Chs. 5-7

		<ul style="list-style-type: none"> • Semantics • Satisfiability & validity • Completeness & compactness • Undecidability & incompleteness • Godel's Incompleteness theorem 	
21-27	To understand the importance of verification and the various approaches to verification	<ul style="list-style-type: none"> • Need for verification • Approaches to verification • Verification by model checking • Temporal Logic • LTL • Limitations of LTL • CTL & CTL* 	Ch. 3
28-32	To understand the need for verification and the various approaches to program verification	<ul style="list-style-type: none"> • Overview of program verification • Framework for software verification • Hoare logic • Proofs of correctness 	Ch. 4
33-37	To understand the role of modal logic in computer science	<ul style="list-style-type: none"> • History of modal logic • Syntax & semantics • Kripke's Formulation of Modal Logic • Logic engineering • Knowledge in multi-agent systems 	Ch. 5
38-40	To introduce logic programming paradigm and understand its usefulness	<ul style="list-style-type: none"> • Overview of logic programming paradigm • Propositional logic programming • First order logic programming • Prolog 	Class notes

4. Evaluation Scheme:

Components	Duration	Weightage	Date & Time	Remarks
TEST I	60 Minutes	20	24/09/2012 2 TO 3PM	Closed Book
TEST II	60 Minutes	20	05/11/2012 2 TO 3PM	Closed Book
Assignments		20		Open Book
Comprehensive Exam	3 Hours	40	10/12 AN	Closed Book

5. Make-Up: May be given on prior permission and only to genuine cases.

6. Chamber Consultation Hour: B221 3.00-4.00PM (Monday)

7. Notice: Notices concerning this course will be displayed on IPC Notice Board only.

Instructor-in –charge
CS F214/IS F214