MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

Department of Computer Science & Engineering
Course Hand-out

Formal Methods in Computer Science | CS 2101 | 4 Credits |

Session: July '15 – December '15 | Faculty: Satyabrata Roy

Course Outcomes: At the end of the course, students will be able to

[2101.1]. Design abstract model of computation for formal languages.
[2101.2]. Design and categorize a given set of formal language and verify its complexity.
[2101.3]. Verify whether a given set of problem belongs to P type, NP-type or other categories.
[2101.4]. Assess the decidability of a given problem by constructing Turing Machine.
[2101.5]. Critically analyse the theoretical study of different computational concepts in this course and their applications in different engineering applications and enhance employability skills.
[2101.6]. Apply different properties of formal languages to prove and disprove theorems, establishing key properties of formal methods.

A. SYLLABUS

Mathematical Preliminaries and Notation: Introduction: Set Theory, Sequences, Tuples, Functions, Relations, Finite Automata: The Acceptance Problem for DFAs, Context Free Grammars, Linear Bound Automata, Turing Machines: The Halting Problem, The Church Turing Thesis, Universal Turing Machine, Hilbert's Tenth Problem, Enumerators, Decidable Languages, Computation Histories, Russell's Paradox, Emptiness Problem, Post Correspondence Problem, Computable Functions: Reducibility, Recursion Theorem, Logical Theories, , Oracle's Turing Reducibility, A definition of Information, Incompressible Strings, Complexity Theory and Notations: Time Complexity, Non Deterministic Time, P Class and NP Class Polynomial Time Verifiers, Subset Sum Problem, NP Completeness.

B. TEXT BOOKS

A) An Introduction to Automata Theory, Languages and Computations - J. E. Hopcroft, R. Motwani, J. Ullman, Pearson Education, Third Edition, 2006.
B) Introduction to the Theory of Computation – Michael Sipser, Cengage Learning, Third Edition, 2012.