Department of Computer Science and Engineering

National Institute of Technology Calicut

Tentative Course Details - Monsoon 2020-21 (September 2020 – January 2021)

CS3001D Theory of Computation

Course code and title: CS3001D Theory of Computation

Class Timings: Mon 10:15-11:15, Wed 11:15-12:15, Thu 8:00-9:00, Thu 1:00-2:00pm

Faculty: Dr. K S Sudeep (sudeep@nitc.ac.in) and Dr. Raju Hazari (rajuhazari@nitc.ac.in)

Prerequisites: Nil.

Course Outcomes:

At the end, the students should be able to:

CO1: Classify a given language according to its level in the Chomsky hierarchy and design grammars /Machines for the language.

CO2 : Construct finite state machines, pushdown automata and turing machines for a given language.

CO3: Prove undecidability of a given problem using diagonal method or reduction.

CO4: Prove NP completeness of a given problem using polynomial time reductions, and prove NP completeness of SAT by Cook-Levin Theorem.

Syllabus:

Module 1: (13 Hours)

Basic concepts of Languages, Automata and Grammar. Regular Languages - Regular expression - finite automata equivalence, Myhill Nerode theorem and DFA State Minimization, Pumping Lemma and proof for the existence of non-regular languages.

Module 2: (13 Hours)

Context Free languages, CFL-PDA equivalence, Pumping Lemma and proof for existence of non-Context Free languages, CYK Algorithm, Deterministic CFLs, Chomsky Schutzenberger Theorem.

Module 3: (13 Hours)

Turing Machines: recursive and recursively enumerable (turing decidable and turing recognizable) languages, Universality of Turing Machine, Church Thesis. Chomsky Hierarchy, Undecidability, Reducibility, Undecidability: Recursive and recursively enumerable sets.

Module 4: (13 Hours)

Complexity: Time and space complexity classes, hierarchy theorems, reductions and completeness, NP Completeness and PSPACE completeness, examples.

Reference books :

1. M. Sipser, Introduction to the Theory of Computation, Thomson, 2001.
2. Peter Linz, An Introduction to Formal Languages and Automata, Fifth Edition,

Evaluation plan :

Mid Term Test : 30 marks (Part of Module 1, Part of Module 3), in second week of October 2020.
Remaining : To be announced.

Assignments will be uploaded periodically on the course page, and will help the students understand the concepts better. Solving the assignments is considered as a pre-requisite for the tests. Tutorial sessions will be conducted during regular class hours as need be.

Standard of Conduct:

Any academic dishonesty will be reported to the department council for permission to assign F grade in the course.