Theory of Computation (3-1-0)

Evaluation:

	Theory	Practical	Total
Sessional	50	-	50
Final	50	-	50
Total	100	-	100

Course Objectives:
To provide basic knowledge of the theory of automata, formal languages, and computational complexity.

Course Contents:

1. Introduction (2 hrs)
1.1 Brief review of set, relation and functions
1.2 Alphabet and language

2. Finite Automata and Regular Expression (8 hrs)
2.1 Deterministic finite automata, Non-deterministic finite automata,
2.2 Regular expressions, equivalence of regular language and finite automata
2.3 Properties of regular language
2.4 The pumping lemma for regular sets
2.5 Closure properties of regular sets
2.6 Decision algorithms for regular sets.

3. Context-free Language (8 hrs)
3.1 Context-free grammar
3.2 Derivative trees and simplification of context- fee grammars
3.3 Normal forms

4. Pushdown Automata (10 hrs)
4.1 Introduction
4.2 Equivalence of pushdown automata and context-free grammars
4.3 Properties of Context-free languages (CFL)
4.4 The pumping lemma for CFI's
4.5 Closure properties of CF's
4.6 Decision algorithms for CFLs

5. Turing Machines (8 hrs)
5.1 Introduction to Turing machine
5.2 Computing with Turing machine
5.3 Extensions of Turing machines
5.4 Computable languages and functions,

6. Undecidability

6.1 Church's Thesis

6.2 Halting problem

6.3 Universal Turing machines **(5 hrs)**

6.4 Undecidable problems about Turing machines

6.5 Recursive function theory

6.6 Properties of recursive and recursively enumerable languages

7. Computational Complexity Theory **(4 hrs)**

7.1 Computable languages and functions

7.2 Class P and class NP problems

7.3 NP-complete problems

References:

1 R. McNaughton, Elementary Computability, Formal languages and Automata. Prentice Hall of India.

2 H.R Lewis, and C.H Papadimitriou, Element of the Theory of Computation, Eastern Economy Edition, Pretice Hall of India.

3 E. Engeler, Introduction to the Theory of Computation, Academic Press.