

**Nirma University**  
**Institute of Technology**  
**B.Tech. in Computer Science and Engineering**  
**Semester- VI**

L	T	P	C
3	1	0	4

<b>Course Code</b>	2CS601
<b>Course Title</b>	Theory of Computation

**Course Outcomes:**

At the end of this course, student will be able to:

1. understand formal language theory and its application to computer science
2. apply mathematical preliminaries to develop the basic components of language design
3. design simple computational machines using the concepts of language theory
4. correlate computability with formal computational machines.

**Syllabus:**

**Teaching Hours:45**

**Unit I**

**5**

**Review of Mathematical Terms and Theory:** Basic Mathematical Notations and Set Theory, Logic Functions and Relations, Language Definitions, Mathematical Inductions and Recursive definitions

**Unit II**

**8**

**Finite Automata:** Deterministic and Non Deterministic Finite Automata,  $\cup$ -Transitions, Conversion from NFA to DFA, Kleene's Theorem, Regular and Non Regular Languages

**Unit III**

**10**

**CFG (Context Free Grammar):** Introduction To CFG, CFG and Known Languages, Unions Concatenations and \*S Notations and CFL, Derivations of Trees and Ambiguity, Unambiguous CFG and Algebraic Expressions, Normal Forms and Simplified Forms

**Unit IV**

**12**

**Pushdown Automata, CFL and NFL:** Introduction To PDA, Definition, DPDA, PDA corresponding to CFG, CFG Corresponding To PDA, Introduction To CFL, Intersections and Complements of CFL, Decisions Problems and CFL

**Unit V**

**10**

**Turing Machines, Recursive Language:** Model of Computation and Church Turing Thesis, Definition of Turing Machine, TM and Language Acceptors, Variations of TM, Non Deterministic TM, Universal TM, Enumerable and Language, Recursive and Non Recursive Enumerable Computation Functions, Measuring, Classifications and Complexity, Primitive Recursive Functions, Halting Problem, Recursive Predicates and Some Bounded Operations



**Self-Study:**

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

**Tutorial:**

The tutorial contents will be declared at the commencement of semester.

**Suggest readings<sup>^</sup>;**

1. John C. Martin, Introduction To Languages and Theory of Computation, TMH
2. A.V. Aho, Ravi Sethi, J. D. Ullman, Compiler tools Techniques, Addison Wesley publication
3. Michael Sipser, Thoery of Computation, Thomson

L=Lecture, T=Tutorial, P=Practical, C=Credit

---

<sup>^</sup>this is not an exhaustive list