

|   |  |                         |
|---|--|-------------------------|
| <b>Subject:</b>   | <b>Theory of Computation</b>   |                         |
| <b>Subject Code:</b>  | <b>ETCS-206</b>  |                         |
| <b>Unit No.</b>   | <b>Topics to be Covered</b>  | <b>Lecture Allotted</b> |
| <b>Unit- 1</b>  | Sets, Sequences, Tuples, Alphabets, Strings & Languages, Operation on Strings, Kleene Closure of any set, Finite and Infinite language, Regular expression of any set  | 1                       |
|   | Define Automata, DFA, Design of DFA with some examples, Equivalence between DFA and Regular Language, Regular expression representation of DFA                         | 1                       |
|   | NDFA, Design of FA Continued, Limitation of DFA, Application of DFA  | 1                       |
|   | Design of FA continued, NDFA to DFA equivalence with examples  | 1                       |
|   | Minimization of finite Automata with examples  | 1                       |
|   | Complement, Reverse of Given DFA and Equivalence of Two DFA with examples, Application of DFA, NDFA as a text searching.   | 1                       |
|   | Mealy and Moore Machine, Design and Equivalence with examples  | 1                       |
|   | Chomsky Classification of Language, Regular Language, Kleen's Theorem, Closure Properties of regular language  | 1                       |
|   | Transition System, Null move, Removal of null moves with examples  | 1                       |
|   | Arden's Theorem, Finding regular expression for a given DFA using Arden's Theorem, Equivalence of Two Regular Expression   | 1                       |
| Pumping Lemma for regular language with proof and its application | 1  |                         |
| <b>Unit-2</b>   | Context free grammar and derivation tree   | 1                       |
|   | Ambiguity in CFG and its removal.  | 1                       |
|   | Simplification of CFG- (i) Removal of variables that does not derive any terminal string (ii) Removal of variables and terminals that do not appear in sentential form | 1                       |
|   | (iii) Elimination of null production (iv) Elimination of unit production   | 1                       |
|   | Griebach Normal Form (GNF)   | 1                       |
|   | Chomsky Normal Form (CNF)  | 1                       |

|               |   |    |
|---------------|---|----|
|               | Pushdown Automata, Deterministic and non-deterministic, Acceptance of PDA by Null storage and Final state | 1  |
|               | PDA to CFG and CFG to PDA Conversion  | 1  |
|               | Pumping Lemma for Context free languages  | 1  |
|               | Overview of LEX, YACC   | 1  |
|               | Closure properties of CFG   | 1  |
| <b>Unit-3</b> | TM and its representation, Its language and Design  | 1  |
|               | TM design continued   | 1  |
|               | Deterministic and Non-deterministic TM  | 1  |
|               | TM with stationary head, Multiple Track   | 1  |
|               | Multi-Tape TM, UTM & TM   | 1  |
|               | TM as Enumerator, Define Algorithm, Hilbert's Problems  | 1  |
|               | Linear Bounded Automata   | 1  |
|               | Turing Church's Thesis  | 1  |
|               | Recursive and recursively enumerable language   | 1  |
|               | Decidability and Undecidability, Halting problem of TM  | 1  |
|               | Post Correspondence Problem   | 1  |
| <b>Unit-4</b> | Introduction to Complexity classes  | 1  |
|               | Computability and Intractability  | 1  |
|               | Time complexity, Class P with example to find path between two vertices (PATH problem)                    | 1  |
|               | NP with example of Hamiltonian path, P vs. NP, Co-NP  | 1  |
|               | NP-C with example of satisfiability problem   | 1  |
|               | Cook's Theorem, Space Complexity  | 1  |
|               | Savich Theorem  | 1  |
|               | SPACE, PSPACE   | 1  |
|               | L with example of PATH  | 1  |
|               | NL with example   | 1  |
|               | Co-NL   | 1  |
|               | Total Lectures:   | 44 |

Subject Co-ordinator: **Dr. Lalit Mohan Goyal (9910512749)**