

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPT./CENTRE: **Electronics and Computer Engineering**

1. Subject Code: **EC-355** Course Title: **Theory of Computation**

2. Contact Hours: **L: 3 T: 1 P: 0**

3. Examination Duration (Hrs.): **Theory**

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4. Relative Weightage: **CWS**

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5. Credits:

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 6. Semester

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Autumn Spring Both

7. Pre-requisite: **EC-254**

8. Subject Area: **DCC**

9. Objective: To provide an understanding of the theoretical development of computer science, particularly for finite representations of languages and machines.

10. Details of the Course:

| Sl. No. | Contents | Contact Hours |
|---------|--|---------------|
| 1. | Abstract machines and computation, formal languages and grammars. | 3 |
| 2. | Regular languages, finite state machines, deterministic and non-deterministic finite state machines, regular grammars, regular expressions, equivalence of the three models, state equivalence and minimization. | 9 |
| 3. | Properties of finite state languages, closure, decidability, pumping lemma. | 5 |
| 4. | Context-free language models, context-free grammars, simplification of content-free grammars, Chomsky normal form, Greibach normal form. | 5 |
| 5. | Pushdown automata, deterministic and non-deterministic pushdown automata and their equivalence with context free languages, parsing. | 7 |
| 6. | Closure properties of context-free languages. | 3 |
| 7. | Turing machines, computable languages and functions, modifications of Turing machines, restricted Turing machines, Church's hypothesis. | 6 |
| 8. | Recursive, and recursively enumerable languages; Undecidability, notion of reduction. | 4 |
| | Total | 42 |

11. Suggested Books:

| Sl. No. | Name of Books / Authors | Year of Publication |
|----------------|--|----------------------------|
| 1. | Hopcroft, J.E., Motwani, R. and Ullman, J.D., “Introduction to Automata Theory, Languages and Computation”, Pearson Education. | 2001 |
| 2. | Lewis, H.R. and Papadimitriou, C.H., “Elements of the Theory of Computation”, 2 nd Ed., Prentice-Hall. | 1998 |
| 3. | Linz, P., “An Introduction to Formal Languages and Automata”, Narosa Publishing House. | 1998 |
| 4. | Cohen, D.I.A., “Introduction to Computer Theory”, John Wiley & Sons. | 1991 |
| 5. | Denning, P.J., Dennis, J.B., and Qualitz, J.E., “Machines, Languages and Computation”, Prentice-Hall. | 1978 |