

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086
B.Sc. DEGREE: BRANCH – I – MATHEMATICS

SYLLABUS
(Effective from the academic year 2015 -2016)

FORMAL LANGUAGES AND THEORY OF AUTOMATA

CODE: 15MT/UI/FA23

CREDITS : 3

OBJECTIVES OF THE COURSE:

- To introduce basic concepts of graph theory, formal languages and automata theory
- To enhance compiling techniques and expose to computing device

Unit 1

Graph Theory

- 1.1 Definition of a Graph and Examples
- 1.2 Degrees and Subgraphs
- 1.3 Isomorphism of Graphs
- 1.4 Matrix Representation of a Graph
- 1.5 Walks, Trails and Paths
- 1.6 Connectedness and Components (concepts only)
- 1.7 Characterisation of Trees
- 1.8 Connectivity of a Graph
- 1.9 Eulerian Graphs (concepts only)
- 1.10 Hamiltonian Graphs (concepts only)

Unit 2

Automata Theory

- 2.1 Finite Automata (FA) – Introduction and Definition
- 2.2 Representation of Finite Automaton
- 2.3 Acceptability of a String by a Finite Automaton
- 2.4 Language Accepted by a Finite Automaton

Unit 3

Automata Theory (contd.)

- 3.1 Non-deterministic Finite Automata (NFA)
- 3.2 Acceptability of a String by NFA
- 3.3 Equivalence of FA and NFA (concept only)
- 3.4 Procedure for finding an FA equivalent to a given NFA
- 3.5 Properties of Regular Sets (concepts only)

Unit 4

Finite State Machines

- 4.1 Finite-State Machines
- 4.2 The Monoid of a Finite-State Machine

4.3 The Machine of a Monoid

Formal Languages

4.4 Phase-Structure Grammars

4.5 Chomsky Hierarchy of Languages

4.6 Finite Automata and Regular Languages

4.7 Derivation Trees for Content-Free Grammars

4.8 Normal Forms for Content Free Grammar (concepts only)

Unit 5

Project

5.1 Application of Finite Automata and Formal Language

5.2 Design of Vending Machine

5.3 Document Language Design

5.4 Cryptography

5.5 DNA Computing

TEXT BOOKS

Arumugam, S. and Ramachandran, S. *Invitation to Graph Theory*, Scitech, Reprint December 2013.

Chapter 2: 2.1 – 2.4, 2.8

Chapter 4 4.1, 4.2, 4.4

Chapter 5 5.1, 5.2

Chapter 6 6.1

Venkataraman, M K. N. Sridharan and N. Chandrasekaran, *Discrete Mathematics*, The National 2000.

Chapter 12 1-20

BOOKS FOR REFERENCE

Behera, Nayak and Pallnayak, *Formal Languages and Automata Theory*. New Delhi: Vikas, 2014.

Kamala Krithivasan and Rama. R., *Introduction to Formal Languages, Automata Theory and Computation*, Chennai: Pearson, 2009.

JOURNALS

Formal Languages and Automata Theory

Journal of Graph Theory

Discrete Applied Mathematics

Information Processing Letters

WEB RESOURCE

<http://www.iitg.ernet.in/dgoswami/Flat-Notes.pdf>

PATTERN OF EVALUATION

End Semester Examination:

Total Marks: 100

Duration: 3 Hours

Section A: $10 \times 2 = 20$ (Ten questions to be set selecting two from each unit)

Section B: $5 \times 8 = 40$ (Seven questions to be set without omitting any unit)

Section C: $2 \times 20 = 40$ (Three questions to be set without omitting any unit)