	proxy server, Client-side Technologies, Server-side Technologies and hybrid technologies
8-10	avascript, JSON jQuery
11-12	NODE.js, BOOTSTRAP
13-14	Introduction to forums, blogging, portfolio, Developing a responsive website, combining Web Applications and Mobile Applications
15	Search Engines - components, working, optimization, Crawling, BOTS Introduction to cookies and sessions, e-commerce websites and e-carts

Assessment Methods

Written tests, assignments, quizzes, presentations as announced by the instructor in the class.

Keywords

Internet, networks, JSON, AJAX, JQUERY, web application

Theory of Computation (BHCS12) Discipline Specific Core Course - (DSC)

Credit: 06

Course Objective

This course introduces formal models of computation, namely, finite automaton, pushdown automaton, and Turing machine; and their relationships with formal languages. Students will also learn about the limitations of computing machines.

Course Learning Outcomes

On successful completion of the course, a student will be able to:

1. Design a finite automaton, pushdown automaton or a Turing machine for a problem at hand.
2. Apply pumping lemma to prove that a language is non-regular/non-context-free.
3. Describe limitations of a computing machine.

Detailed Syllabus

Unit 1

Languages: Alphabets, string, language, basic operations on language, concatenation, union, Kleene star.

Unit 2

Regular Expressions and Finite Automata: Regular expressions, Deterministic finite automata (DFA).

Unit 3

Regular Languages: Non-deterministic Finite Automata (NFA), relationship between NFA and DFA, Transition Graphs (TG), properties of regular languages, the relationship between regular languages and finite automata, Kleene's Theorem.

Unit 4

Non-Regular Languages and Context Free Grammars: Pumping lemma for regular grammars, Context-Free Grammars (CFG),

Unit 5

Context-Free Languages (CFL) and PDA: Deterministic and non-deterministic Pushdown Automata (PDA), parse trees, leftmost derivation, pumping lemma for CFL, properties of CFL.

Unit 6

Turing Machines and Models of Computations: Turing machine as a model of computation, configuration of simple Turing machine, Church Turing Thesis, Universal Turing Machine, decidability, halting problem.

Practical

Tutorials based on theory.

References

1. Cohen, D. I. A. (2011). *Introduction to Computer Theory*. 2nd edition. Wiley India.

2. Lewis, H.R. & Papadimitriou, H. R. (2002). *Elements of the Theory of Computation*. 6th edition. Prentice Hall of India (PHI)

Additional Resources

1. Goodrich, M., Tamassia, R., & Mount, D.M. (2011). *Data Structures and Algorithms Analysis in C++*. 2nd edition. Wiley.

2. Gopalkrishnan, G.L. (2019) *Automata and Computability: A programmer's perspective*. CRC Press.

3. Linz, P. (2016). *An Introduction to Formal Languages and Automata*.6th edition. Jones and Bartlett Learning.

Course Teaching Learning Process

- Use of ICT tools in conjunction with traditional class room teaching methods
- Interactive sessions
- Class discussions

Tentative weekly teaching plan is as follows:

Week	Topics to be covered
1	Languages: Alphabets, string, language, Basic operations on a Language, concatenation, Kleene Star, Kleene closure.
2	Regular Expression: Definition and use of regular expressions, languages defined by regular expressions, understanding a regular expression, building regular expressions
3	Introduction to finite automata and its relationship with regular expressions, Finite Automata and their languages, deterministic finite automata (DFA).
4	Transition Graphs Relaxing Restrictions on Inputs in TG (Transition Graph), TG vs. FA, Generalized Transition Graphs (GTG), Introduction to Non-determinism.
5	Kleene's Theorm: Turning TGs and FA to regular expressions and vice versa, Depicting union of two Regular Languages (RL) using an FA, Depicting concatenation (Product) of two RL using an FA.
6	Keene Star of a RL (Regular Language) using an FA, Non-deterministic finite automata (NFA), relationship between NFA and DFA, converting NFA to DFA.
7	Regular Languages: Complement and intersection of a regular languages, relationship between regular languages and finite automata.
8	Pumping lemma for regular languages. Introduction to context-free languages.
9	Context Free Grammar: Context free grammars, Parse trees. Introduction to Pushdown Automata (PDA). Pushdown Automata: A new Format for FAs, Introduction to Pushdown Automata (PDA).
10	Pushdown Automata: Adding a pushdown stack, design and analysis of Deterministic PDA, design and analysis of non-deterministic pushdown automata.
11	Non-Context-Free Languages: Pumping Lemma for Context-Free-Languages (CFLs), properties of context free languages.

12	Simple Turing machine as a model of computation and its configuration, computing with Turing machine and its working.
13	Building simple Turing machines, combining Turing machines, Church Turing Thesis.
14-15	Universal Turing machine, semi-decidability and decidability, recursively-enumerable and recursive languages, halting problem.

Assessment Methods

Written tests, assignments, quizzes, presentations as announced by the instructor in the class.

Keywords

Regular expressions and languages, finite automata, context free grammar and languages, pushdown automata, Turing machine.

Artificial Intelligence (BHCS13) Discipline Specific Core Course - (DSC)

Credit: 06

Course Objective

This course introduces the basic concepts and techniques of Artificial Intelligence (AI). The course aims to introduce intelligent agents and reasoning, heuristic search techniques, game playing, knowledge representation, reasoning with uncertain knowledge.

Course Learning Outcomes

On successful completion of this course, students will be able to:

1. Identify problems that are amenable to solution by specific AI methods
2. Represent knowledge in Prolog and write code for drawing inferences.
3. Identify appropriate AI technique for the problem at hand
4. Compare strengths and weaknesses of different artificial Intelligence techniques.
5. Sensitive towards development of responsible Artificial Intelligence

Detailed Syllabus