

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING - CYBER SECURITY

COURSE MODULE OF THE SUBJECT TAUGHT FOR THE SESSION 2026-27 - (ODD SEM)

Faculty Name: Dr. Shwetha G K			Academic Year: 2026 - 2027				
Department: Computer Science & Engineering - Cyber Security							
Course Code	Course Title	Core / Elective	Prerequisite	Contact Hours			Total Hrs/
				L	T	P	Sessions
BCS503	Theory of Computation	Core	Mathematical Foundations	3	2	0	50T
Course Objectives	1. Introduce core concepts in Automata and Theory of Computation. 2. Identify different Formal Language Classes and their Relationships. 3. Learn concepts of Grammars and Recognizers for different formal languages. 4. Prove or disprove theorems in automata theory using their properties. 5.Determine the decidability and intractability of Computational problems.						
Topics Covered as per Syllabus							
Module-1							
Introduction to Finite Automata, Structural Representations, Automata and Complexity. The Central Concepts of Automata Theory. Deterministic Finite Automata, Nondeterministic Finite Automata, An Application: Text Search, Finite Automata with Epsilon-Transitions. TEXT BOOK: Sections 1.1, 1.5, 2.2,2.3,2.4,2.5							
Module-2							
Regular Expressions, Finite Automata and Regular Expressions, Proving Languages not to be Regular. Closure Properties of Regular Languages, Equivalence and Minimization of Automata, Applications of Regular Expressions TEXT BOOK: Sections 3.1, 3.2 (Except 3.2.1), 3.3, 4.1, 4.2, 4.4							
Module-3							
Context-Free Grammars, Parse Trees, Ambiguity in Grammars and Languages, Ambiguity in Grammars and Languages, Definition of the Pushdown Automaton, The Languages of a PDA, Equivalence of PDA's and CFG's, Deterministic Pushdown Automata. TEXT BOOK: Sections 5.1, 5.2, 5.4, 6.1,6.2,6.3.1,6.4							
Module-4							
Normal Forms for Context-Free Grammars, The Pumping Lemma for Context-Free Languages, Closure Properties of Context-Free Languages.							

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TEXT BOOK: Sections 7.1, 7.2, 7.3

Module-5

Introduction to Turing Machines: Problems That Computers Cannot Solve, The Turing Machine, Programming Techniques for Turing Machines, Extensions to the Basic Turing Machine, Undecidability: A Language That Is Not Recursively Enumerable.

TEXT BOOK: Sections 8.1,8.2, 8.3,8.4, 9.1, 9.2

Textbook

John E Hopcroft, Rajeev Motwani, Jeffrey D. Ullman,” Introduction to Automata Theory, Languages and Computation”, Second Edition, Pearson.

Reference Books

1. Elain Rich, “Automata, Computability and complexity”, 1st Edition, Pearson Education, 2018.
2. K.L.P Mishra, N Chandrashekar, 3rd Edition, ‘Theory of Computer Science’, PHI, 2012.
3. Peter Linz, “An introduction to Formal Languages and Automata “, 3rd Edition, Narosa Publishers, 1998.
4. Michael Sipser : Introduction to the Theory of Computation, 3rd edition, Cengage learning, 2013.
5. John C Martin, Introduction to Languages and The Theory of Computation, 3rd Edition, Tata McGraw –Hill Publishing Company Limited, 2013.

Course outcomes: The students should be able to:

- Apply the fundamentals of automata theory to write DFA, NFA, Epsilon-NFA and conversion between them.
- Prove the properties of regular languages using regular expressions.
- Design context-free grammars (CFGs) and pushdown automata (PDAs) for formal languages.
- Design Turing machines to solve the computational problems.
- Explain the concepts of decidability and undecidability

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered

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- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

The Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours**).

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
- The students have to answer 5 full questions, selecting one full question from each module. Marks scored shall be proportionally reduced to 50 marks.
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Course Code:	BCS503	TITLE: Theory of Computation						Faculty Name:	Dr. Shwetha G K			
List of Course Outcomes	Program Outcomes											Total
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	
CO-1	3	3	2	2	-	-	-	-	-	-	-	10
CO-2	3	3	-	-	-	-	-	-	-	-	-	6
CO-3	2	3	3	3	-	-	-	-	-	-	-	11
CO-4	3	3	3	3	-	-	-	-	-	-	-	12
CO-5	2	2	-	-	-	-	-	-	-	-	-	4
Total	13	14	8	8	-	-	-	-	-	-	-	43

Note: 3 = Strong Contribution, 2 = Average Contribution, 1 = Weak Contribution, - = No Contribution

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The Correlation of Course Outcomes (CO's) and Program Specific Outcomes (PSO's)

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List of Course Outcomes	Program Specific Outcomes			Total
	PSO-1	PSO-2	PSO-3	
CO-1	-	-	-	-
CO-2	-	-	-	-
CO-3	-	-	-	-
CO-4	-	-	-	-
CO-5	-	-	-	-
Total	-	-	-	-

Course Co-ordinator

HoD