राष्ट्रीय प्रौद्योगिकी संस्थान रायपुर
NATIONAL INSTITUTE OF TECHNOLOGY RAIPUR
(Institute of National Importance)
G.E. Road, Raipur – 492010 (CG)

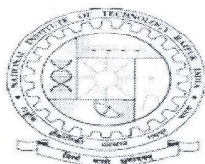Phone: (0771) 225 42 00
Fax: (0771) 225 46 00
Email:
director.nitrr@rediffmail.com
Website: www.nitrr.ac.in

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Scheme (Second Year)

Fourth Semester

S. No.	Course Title	Course Name	L	T	P	Credits
1.	Program Core (CS104101CS)	Computer System Architecture	3	1	0	4
2.	Program Core (CS104102CS)	Analysis & Design of Algorithms	3	1	0	4
3.	Program Core (CS104103CS)	Computer Networks	3	1	0	4
4.	Program Core (CS104104CS)	Principles of Programming Languages	3	1	0	4
5.	Program Core (CS104105CS)	Compiler Design	3	1	0	4
6.	Mathematics Course (CS104001MA)	Mathematics IV	3	1	0	4
7.	Laboratory (CS104401CS)	Computer Networks Lab	0	0	2	1
8.	Laboratory (CS104402CS)	Analysis & Design of Algorithms Lab	0	0	2	1
	Total Credits		**18**	**6**	**4**	**26**

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Departmental of Computer Science & Engineering
Syllabus
B.Tech. IV Semester (Computer Sc. & Engineering)

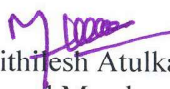| 1.	Department proposing the course	Computer Science & Engineering
2.	Course Title	Computer System Architecture
3.	L-T-P Structure	3-1-0
4.	Credits / # of period	4
5.	Course number(Code)	CCS41
6.	Status (Core/Elective)	Core
7.	Pre-requisites (course no./title)	NIL
8.	Frequency of offer	Once in a year
9.	Course Objectives(CO) : 1. To Understand the CPU architecture and Its Functioning. 2. To understand the current state of art in memory system design 3. To know the working principle of I/O devices 4. To understand the concept of advanced pipelining techniques	
10.	Course Syllabus: **Unit –I CPU Organization & Functioning** CPU Organization, Fundamental and features, Data Representation - Basic formats, Fixed and Floating point representation, Instruction Sets, Formats, Types and Programming Considerations, Addressing modes. Fixed-Point Arithmetic Multiplication Algorithms: Hardware algorithm, Booth Multiplication algorithm, **Unit –II ALU Operations** Division algorithms: Hardware algorithm, Divide overflow algorithm, Combinational ALU and Sequential ALU, Floating point arithmetic operations. Basic Concepts, Hardwired control, Micro programmed Control, CPU control unit and Multiplier control unit **Unit –III Instruction Pipelining & Main Memory** Pipeline Control: Instruction Pipelines, Pipeline performance, Superscalar Processing. Memory device characteristics, RAM technology and Serial access memories technology, Multilevel memory systems, Address translation and Memory allocation systems **Unit –IV Cache Memory & Parallel Processing** Cache memory: Features, address mapping Communication Method: Basic concepts, Bus Control, Programmed I/O , DMA, Interrupts and IO Processors, Parallel Processing: Processor-level Parallelism, Multiprocessor and Fault tolerance system.	

11.	Text Books:- 1. Computer Architecture and organization – John P Hayes, McGraw Hill Publication 2. Computer Organizations and Design- P. Pal Chaudhari, Prentice-Hall of India 3. Computer System Architecture - M. Morris Mano, PHI.
12.	Reference Books :- 1. Computer Organization and Architecture- William Stallings, Prentice-Hall of India 2. Architecture of Computer Hardware and System Software: An Information Technology Approach, 3rd Edition (Illustrated) – Iry Englander, John Wiley & Sons Inc 3. Structured Computer Organization Andrew S Tanenbaum, Prentice-Hall of India 4. Computer Systems Organization & Architecture – John D Carpinelli, Addison-Wesley

Dr. N. K.Nagwani
Member
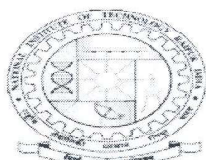
Dr. D.S. Sisodia
Member

Dr. Mithilesh Atulkar
External Member

Dr. Sarsij Tripathi
Convener

Dr. Pradeep Singh
Chairperson , DAC

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Departmental of Computer Science & Engineering
Syllabus
B.Tech. IV Semester (Computer Sc. & Engineering)

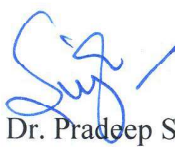| 1.	Department proposing the course	Computer Science & Engineering
2.	Course Title	Analysis & Design of Algorithms
3.	L-T-P Structure	3-1-0
4.	Credits / # of period	4
5.	Course number(Code)	CCS42
6.	Status (Core/Elective)	Core
7.	Pre-requisites (course no./title)	Data Structures
8.	Frequency of offer	Once in a year
9.	Course Objectives(CO) : 1. To understand the importance of algorithm and its complexity 2. To analyze the complexity of an algorithm in terms of time and space complexities 3. To design and implement various programming paradigms and its complexity	
10.	Course Syllabus: **Unit –I Algorithm Analysis and Divide & Conquer Paradigm** Analyzing algorithms, Algorithm types, Recurrence Equations, Growth function: Asymptotic notation, Standard notation & common functions, Recurrence relation, different methods of solution of recurrence equations with examples. Introduction to Divide and Conquer paradigm, Quick and Merge sorting techniques, Heap sort, Counting, Radix and Bucket sort, Basic divide and conquer algorithm for matrix multiplication Strassen Multiplication and, Red Black tree, Binary Search tree. **Unit –II Greedy and Dynamic Programming Approach** Overview of the greedy paradigm examples of exact optimization solution (Minimum Cost Spanning Tree), Knapsack problem, Single source shortest paths. Overview, difference between dynamic programming and divide and conquer, Applications: Shortest path in graph, Matrix Chain multiplication, Traveling salesman Problem, longest Common sequence. **Unit –III Graphs** Representational issues in graphs, Depth first search & Breath first search on graphs, Computation of biconnected components and strongly connected components using DFS, Topological sorting of nodes of an acyclic graph & applications, Shortest Path Algorithms , Bellman-Ford algorithm, Dijkstra's algorithm & Analysis of Dijkstra's algorithm using heaps, Floyd-Warshall's all pairs shortest path algorithm	

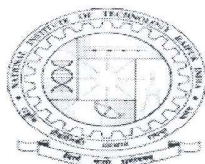|	
	Unit –IV String Matching, Backtracking & Np Problems The general string problem as a finite automata, Knuth Morris and Pratt algorithms, Linear time analysis of the KMP algorithm, The Boyer-Moore algorithm. Backtracking & Recursive backtracking, Applications of backtracking paradigm ,Complexity measures, Polynomial Vs non polynomial time complexity; NP- hard and NP-complete classes, examples.
11.	Text Books:- 1. Introduction to Algorithm- Coreman, Rivest, Lisserson, PHI. 2. Fundamental of Computer Algorithm- Horowitz & Sahani, Galgotia.
12.	Reference Books :- 1. Computer Algorithms: Introduction to Design & Analysis- Basse, Addison Wesley.

Dr. N. K.Nagwani
Member

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Member

Dr. Mithilesh Atulkar
External Member

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Departmental of Computer Science & Engineering
Syllabus
B.Tech. IV Semester (Computer Sc. & Engineering)

1.	Department proposing the course	Computer Science & Engineering
2.	Course Title	Computer Networks
3.	L-T-P Structure	3-1-0
4.	Credits / # of period	4
5.	Course number(Code)	CCS43
6.	Status (Core/Elective)	Core
7.	Pre-requisites (course no./title)	NIL
8.	Frequency of offer	Once in a Year
9.	Course Objectives(CO) :

1. To provide insight about networks, topologies, and the key concepts.

2. To gain comprehensive knowledge about the layered communication architectures (OSI and TCP/IP) and its functionalities.

3. To understand the principles, key protocols, design issues, and significance of each layers in ISO and TCP/IP.

4. To know the basic concepts of network security and its various security issues related with each layer. | |
| 10. | Course Syllabus:

Unit -I Introduction to Computer Network

Introduction to Computer Networks, Network hardware, Network software, OSI & TCP/IP Reference model, Physical layer services & Transmission Media, Guided Media and Unguided Media, Switching technique and its timing diagram.

Unit –II Data Link Control

Design issues, Flow Control, Error Detection & Error Control, Channel allocation problem, MAC protocols: Pure ALOHA & Slotted ALOHA, CSMA, CSMA/CD, IEEE Standards(IEEE 802.3, IEEE 802.4, IEEE 802.5), FDDI: Access method, Addressing, Electrical specification, Frame format, Comparison of FDDI-I & FDDI-II, DQDB.

Unit -III Network Layer

Network Layer Protocols, Design issues, Virtual Circuits and datagram's, Internetworking devices, Routing Algorithms: Optimality principle, Shortest path routing- Dijkstra's algorithms, Distance Vector routing, Link state routing, Flow and Congestion Control: Packet discarding, Traffic shaping, Choke packets, RSVP, IP fragment, RIP, OSPF, IP protocol, IP addresses, ARP, RARP, ICMP, Mobile IP, Quality of Service. | |

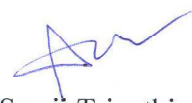|	
	Unit -IV Transport Layer & Upper Layers Functions of the transport layer: End to End Delivery, Addressing, Reliable delivery, Flow control, Multiplexing, Connection Management: Establishment and Releases, Crash Recovery, TCP & UDP, Wireless TCP and UDP. Session Layer, Presentation layer functions, Application layer protocols & services: Network Security Email, WWW, FTP, DNS.
11.	Text Books:- 1. Computer networks, Fifth Ed., A.S. Tannenbaum, Prentice Hall India. 2. Data Communication & Networking, B.A. Forouzan, Tata Mc Graw Hill.
12.	Reference Books :- 1. Data Networks, D.Bertsekas and R. Gailagher, PHI Fifth Ed. 2. Internetworking with TCP/IP, Vol. 1, D.E. Comer, Prentice Hall India. 3. Computer Networking with IP, Stalling, Pearson Education.

Dr. N. K.Nagwani
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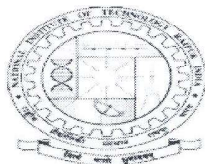
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Departmental of Computer Science & Engineering
Syllabus
B.Tech. IV Semester (Computer Sc. & Engineering)

1.	Department proposing the course	Computer Science & Engineering
2.	Course Title	Principles of Programming Languages
3.	L-T-P Structure	3-1-0
4.	Credits / # of period	4
5.	Course number(Code)	CCS44
6.	Status (Core/Elective)	Core
7.	Pre-requisites (course no./title)	NIL
8.	Frequency of offer	Once in a Year
9.	Course Objectives(CO) : 1. To introduce programming paradigms, and the principles and techniques involved in design and implementation of modern programming languages. 2. To introduce notations to describe syntax and semantics of programming languages. 3. To analyze and explain behavior of simple programs in imperative languages using concepts such as binding, scope, control structures, subprograms and parameter passing mechanisms. 4. To introduce the concepts of concurrency control and exception handling	
10.	Course Syllabus: **Unit -I Imperative & Object-Oriented Programming** The Role of Programming Languages: - Toward Higher-level Languages, Problems of Scale, Programming Paradigms, Language Implementation Bridging the Gap. Language Description:- Syntactic Structure, Variants of Grammars. Statements: Structured Programming, Types: Data Representation, Procedure Activations, Introduction to Object-Oriented Programming. **Unit -II Functional Programming** Elements of Functional Programming:- A little Language of expressions, Types: Values and Operations, Function declarations, Approaches to Expression Evaluation, Lexical Scope, Type Checking. Functional Programming in a Typed Languages:- Exploring a List, Function Declaration by Cases, Functions as First-Class Values, ML: Implicit Types, Data Types, Exception Handling in M, Little quit in Standard ML. Functional Programming with Lists. **Unit -III Logic Programming** Logic Programming:- Computing with Relations, Introduction to Prolog, Data Structures in Prolog, Programming techniques, Control in Prolog, Cuts.	

	Unit –IV Concurrent Programming An Introduction to Concurrent Programming:- Parallelism in Hardware, Streams: Implicit Synchronization, Concurrency as interleaving, Liveness Properties, Safe Access to Shared Data, Concurrency in Ada, Synchronized Access to Shared variables.
11.	Text Books:- 1. Programming Languages – Design & Implementation, Terrance W. Pratt, Marvin V. Zelkowitz, and Pearson Education. 2. Concepts of Programming Languages – Robert L. Sebesta, Pearson Education. 3. Programming Languages – Concepts & Constructs, Ravi Sethi, Pearson Education.
12.	Reference Books :- 1. Principles of Programming Languages: Design, Evaluation, and Implementation by Bruce J. Mac Lennan, 2nd edition.One copy is on reserve in the Science Library 2. Kenneth C. Louden. Programming Languages: Principles and Practice, 2nd Edition

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External Member

Dr. Sarsij Tripathi
Convener

Dr. Pradeep Singh
Chairperson , DAC

Compiler Design

[4th Semester, Second Year]

Course Description

Offered by Department	Credits	Status	Code
Compiler Design	3-1-0, (4)	EPR	CS104101CS

[Pre-requisites:
1. Theory of Automata and Formal languages
2. Data Structures and Algorithms
3. Computer architecture (assembly programming)]

Course Objectives
1. To acquire modern compilers knowledge in particular, the lexical analysis, syntax, and semantic analysis, code generation and optimization phases of compilation.
2. To acquire the knowledge of designing various parsers without using compiler generation tools.
3. To learn the new code optimization techniques to improve the performance of a program regarding speed & space.
4. To learn the new code optimization techniques to improve the performance of a program regarding speed & space.

Course Content
Unit-1 Introduction and Lexical Analysis:
Compilers, Analysis of the source program, Phases of a compiler, Cousins of the Compiler, Grouping of Phases, Compiler construction tools, Lexical Analysis, Role of Lexical Analyzer, Input Buffering, Specification of Tokens (Regular expression, Finite automata, Conversion of FAs') , Context-Free Grammars, Writing Grammars.

Unit-2 Syntax Analysis:
Role of the parser – Top-Down parsing – Recursive Descent Parsing – Predictive Parsing –Bottom-up parsing – Shift Reduce Parsing – Operator Precedence Parsing – LR Parsers – SLR Parser – Canonical LR Parser – LALR Parser.

Unit-3 Semantic analysis and Intermediate codes:
Intermediate languages–Declarations – Assignment Statements – Boolean Expressions –Case Statements – Back patching–Procedure calls Runtime Environments–Source Language issues–Storage Organization –Storage Allocation strategies–Access to non-local names-Parameter Passing, Error detection and recovery.

Unit-4 Code Optimization and Generation:
Introduction – Principal Sources of Optimization – Optimization of basic Blocks – DAG, representation of Basic Blocks -Introduction to Global Data Flow Analysis –Issues in the design of code generator – The target machine–Runtime Storage management – Basic Blocks and Flow Graphs – Next use Information – A simple Code generator – Peephole Optimization.
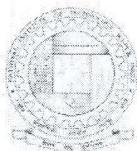
Course Materials

Required Text: Text books
1. Alfred V. Aho, Ravi Sethi, and Jeffrey D. Ullman, "Compilers: Principles, Techniques, and Tools" Addison-Wesley, Second Edition.
2. Kenneth C. Louden, "Compiler Construction: Principles and Practice", Thompson Learning.
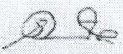
Optional Materials: Reference Books
1. Alfred V. Aho, Jeffrey D Ullman, "Compilers: Principles, Techniques and Tools", Pearson Education Asia.
2. Steven S. Muchnick, "Advanced Compiler Design Implementation", MorganKaufmann Publishers.
3. C. N. Fisher and R. J. LeBlanc "Crafting a Compiler with C", Pearson Education.
4. Dhamdhere, D. M.,"Compiler Construction Principles and Practice", 2nd edition, Macmillan India Ltd., New Delhi.
5. HenkAlblas and Albert Nymeyer, "Practice and Principles of Compiler Building with C", PHI.

B. Tech. 4th Semester (Computer Science & Engg.)

1.	Department proposing the course	Mathematics
2.	Course Title	Mathematics-IV (Numerical Methods)
3.	L-T-P Structure	3-1-0
4.	Credits / # of period	4/40
5.	Course number(Code)	CMA41(CS)
6.	Status (Core/Elective)	Core
7.	Pre-requisites (course no./title)	Mathematics-I, Mathematics-II
8.	Frequency of offer	Regular

9. COURSE OBJECTIVES(CO):

To enable the students to apply the knowledge of Mathematics in various fields:

1. To solve the algebraic, transcendental and simultaneous linear equations and its application.

2. To solve the problems related to data appear equal or unequal intervals and to obtain a functional relationship between the observed values.

3. To calculate the derivative of the function and evaluate the definite Integral from set of numerical values.

4. To solve the ordinary differential equations using different numerical techniques.

10. COURSE SYLLABUS:

UNIT-1: NUMERICAL SOLUTIONS OF ALGEBRAIC, TRANSCENDENTAL AND SIMULTANEOUS LINEAR EQUATIONS

Errors in numerical computation, Error type, Bisection Method, Regula – Falsi Method, Secant Method, Newton-Raphson Method, Direct Methods - Gauss Elimination, Gauss-Jordan & Crout's Triangularisation Method, Iterative Methods -Jacobi's, Gauss- Seidel & Relaxation Method.

UNIT-2: INTERPOLATION AND CURVE FITTING

Finite differences, Forward, Backward & Central difference Interpolation, Lagrange's method and Newton's Divided Difference method, Principle of Least Squares, Fitting a straight Line, Fitting a Parabola, Exponential Function and Method of Group Averages.

UNIT-3: NUMERICAL DIFFERENTIATION AND INTEGRATION

Derivatives using Forward, Backward and Central Difference method, Derivatives using unequally spaced values, Newton-Cote's Quadrature method, Trapezoidal rule, Simpson's 1/3 rule, Simpson's 3/8 rule, Weddle's rule.
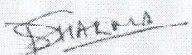
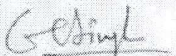|	**UNIT-4: NUMERICAL SOLUTIONS OF ORDINARY DIFFERENTIAL EQUATIONS**
	Picard's Method, Taylor's Series Method, Euler's Modified Method, Runge-Kutta Method of Fourth Order, Milne's Method, Adams–Bashforth Method to solve ODE.
11.	**TEXT BOOKS:-**
	1. M. K. Jain, S. R. K. Iyengar & R. K. Jain Numerical Methods for Scientific and Engineering Computation, New Age International (P) Limited, Publisher. 2. B. S. Grewal, Numerical Method in Engineering and Science, Khanna Publisher. 3. J. D. Hoffman, Numerical Methods for Engineers and Scientists, McGraw-Hill, Inc. Publisher.
12.	**REFERENCE BOOKS:-**
	1. P. Kandasamy, K. Thilagavathy, & K. Gunavathi, Numerical Methods, S. Chand Publisher. 2. E. Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons Inc. Publisher. 3. S. S. Sastry, Introductory Methods of Numerical Analysis, PHI, Publisher.

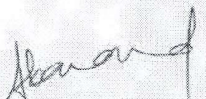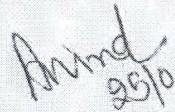Dr. S. K. Samanta
(Member, DAC)

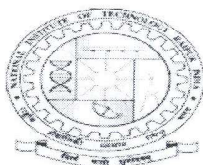Dr. D. Mishra
(Member, DAC)

Dr. S. N. Raw
(Member, DAC)

Dr. A. Khare
(External Member, DAC)

Dr. D. Sharma
(Convener, DAC)

Dr. G. P. Singh
(External Academic expert)
Professor
Department of Mathematics
VNIT Nagpur

Mr. Akanand Dewangan
(External Industrial expert)
Director Production
KAPS Foods Limited, Raipur
Raipur

Dr. A. K. Sinha
25/01/19
(Chairperson, DAC)

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Departmental of Computer Science & Engineering
Syllabus
B.Tech. IV Semester (Computer Sc. & Engineering)

1.	Department proposing the course	Computer Science & Engineering
2.	Course Title	Computer Networks Lab
3.	L-T-P Structure	0-0-2
4.	Credits / # of period	1
5.	Course number(Code)	
6.	Status (Core/Elective)	Core
7.	Pre-requisites (course no./title)	NIL
8.	Frequency of offer	Once in a Year
9.	Course Objectives(CO) :	

9. Course Objectives(CO) :

1. To implementation of OSI layer protocols
2. To have a hands on experience of computer network simulation and modeling techniques.

10. Course Syllabus:

1. Introduction to Local Area Network with its cables, connectors and topologies.
2. Installation of Switch. Hub their cascading and network mapping.
3. Installation of UTP, Co-axial cable, Cross cable, parallel cable.NIC and LAN card.
4. Case Study of Ethernet (10 base 5,10 base 2,10 base T)
5. Installation and working of Net meeting and Remote Desktop.
6. Installation and working with Telnet (Terminal Network).
7. Installation and working with FTP (File Transfer Protocol).
2. Installation and Computers via serial or Parallel ports and enable the computers to share disk and printer port.
3. Installation of NS-2/3 Network Simulator: Basics of Network Simulation
4. Simulating a Local Area Network and LAN Topologies
5. Implementation of various MAC protocols
6. Measuring Network Performance: Network Performance Evaluation, Performance Evaluation Metrics.
7. Performance Evaluation of routing protocols.
8. Parameters Affecting the Performance of Networks, Performance Evaluation Techniques, Network Performance Evaluation using NS-2/3.

11.	Text Books:
	1. Computer networks, Fifth Ed., A.S. Tannenbaum, Prentice Hall India.
	2. Data Communication & Networking, B.A. Forouzan, Tata Mc Graw Hill.
12.	Reference Books :-
	1. Computer Network and internet by Dougles E. Comer (Pearson Education)
	2. NS Simulator for Beginners - Eitan Altman and Tania Jimenez, Morgan & Claypool Publishers, 2011
	3. An Introduction to Network Simulator 3- Jack L. Burbank, 1st edition, Wiley-Blackwell, 2015

Dr. N. K.Nagwani
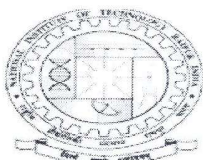Member

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Departmental of Computer Science & Engineering
Syllabus
B.Tech. IV Semester (Computer Sc. & Engineering)

1.	Department proposing the course	Computer Science & Engineering
2.	Course Title	Analysis & Design of Algorithms - Lab
3.	L-T-P Structure	0-0-2
4.	Credits / # of period	1
5.	Course number(Code)	
6.	Status (Core/Elective)	Core
7.	Pre-requisites (course no./title)	NIL
8.	Frequency of offer	Once in a Year
9.	Course Objectives(CO) : 1. To learn how to analyze the complexity of algorithms 2. To compare and evaluate algorithms in terms of time and space complexity 3. To program brute force, divide and conquer, decrease and conquer, transform and conquer, greedy, and dynamic techniques	
10.	Course Syllabus: 1. Estimating worst-case/average-case complexity of linear time sorting algorithms via programs. 2. Estimating worst-case/average-case complexity of logarithmic time sorting algorithms via programs. 3. Estimating worst-case/average-case complexity of quadratic time sorting algorithms via programs. 4. Implementing greedy algorithms. 5. Implementing Dynamic programming problems 6. Implementing Minimum Spanning Tree and estimate the complexity. 7. Implementation of searching algorithms for graphs. 8. Solving miscellaneous problems e.g. problems in string manipulation, graph theory & optimization.	
11.	Text Books:- 1. Introduction to Algorithms - Coreman, Rivest, Lisserson, PHI publisher	
12.	Reference Books :- 1. Algorithm Design - Jon Kleinberg and Eva Tardos, Pearson	

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