DETAILED SYLLABUS FOR 5th SEMESTER

Paper Code: ARI 305	L	T/P	Credits
Subject : Data Analytics	4	-	4

Marking Scheme:
Teachers Continuous Evaluation: As per university examination norms from time to time.
End Term Theory Examination: As per university examination norms from time to time.

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks: As per University Norms

➢ There should be 9 questions in the end term examination question paper.

➢ Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 15 marks.

➢ Apart from Question No. 1, the rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, students may be asked to attempt only 1 question from each unit. Each question should be 15 marks.

➢ The questions are to be framed keeping in view the learning outcomes of course/paper. The standard/ level of the questions to be asked should be at the level of the prescribed textbooks.

➢ The requirement of (scientific) calculators/ log-tables/ data-tables may be specified if required.

Course Outcomes[Bloom's Knowledge Level (KL)]:

CO1	Ability of students to understand the basics concepts of Data Analytics **[K1, K2]**
CO2	Ability of students to apply and analyze various classification and regression techniques **[K3,K4]**
CO3	Ability of students to understand mining frequent itemsets and apply clustering techniques [K1, **K2, K3]**
CO4	Ability of students to understand Big data frameworks **[K1,K2]**

CO/ PO	**PO01**	**PO02**	**PO03**	**PO04**	**PO05**	**PO06**	**PO07**	**PO08**	**PO09**	**PO10**	**PO11**	**PO12**
CO1	3	2	1	1	3	-	-	-	2	2	1	2
CO2	3	3	3	3	3	-	-	-	3	3	4	2
CO3	3	2	1	1	3	-	-	-	2	2	1	3
CO4	3	3	3	3	3	-	-	-	3	3	3	3

Course Content	**No of lectures**

Unit I **Introduction to Data Analytics**: Sources and nature of data, classification of data (structured, semi-structured, unstructured), characteristics of data, introduction to Big Data platform, need of data analytics, evolution of analytic scalability, analytic process and tools, analysis vs reporting, modern data analytic tools, applications of data analytics. **Data Analytics Lifecycle**: Need, key roles for successful analytic projects, various phases of data analytics lifecycle – discovery, data preparation, model planning, model building, communicating results, operationalization.	[10]
Unit II **Data Analysis:** Data preprocessing, feature engineering, dimension reduction, Regression modelling: linear regression, non linear regression, regularized regression, Neural Networks: learning and generalisation, perceptron, logistic regression, Bayesian modeling, support vector and kernel methods, K- Nearest Neighbour Classifiers, analysis of time series: linear systems analysis & nonlinear dynamics.	[12]
Unit III **Frequent Itemsets and Clustering:** Mining frequent itemsets, market based modelling, Apriori algorithm, handling large data sets in main memory, limited pass algorithm, counting frequent itemsets in a stream, clustering techniques: hierarchical, K-means, clustering high dimensional data, DBSCAN, CLIQUE and ProCLUS.	[10]
Unit IV **Frame Works:** MapReduce, Hadoop, Pig, Hive, HBase, MapR, Sharding, NoSQL Databases, S3, Hadoop Distributed File Systems **Visualization:** visual data analysis techniques, interaction techniques, systems and applications. **Case studies –** Real time sentiment analysis, stock market predictions.	[10]

Text Books:

[T1] David Dietrich, Barry Heller, Beibei Yang, (2015). Data Science and Big Data Analytics, EMC Education Series, John Wiley

Reference Books:

[R1] Sebastian Raschka,Vahid Mirjalili, (2019), Python Machine Learning - Third Edition, Pact Publisher.
[R2] Tom M. Mitchell, (1997). Machine Learning, McGraw-Hill
[R3] Duda, R. O. & Hart, P. E. (2006). Pattern Classification. John Wiley & Sons.

Paper Code: ARI 307	L	T/P	Credits
Subject: Principles of Communication Systems	4	-	4

Marking Scheme:
Teachers Continuous Evaluation: As per university examination norms from time to time.
End Term Theory Examination: As per university examination norms from time to time.

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks: As per University Norms

- There should be 9 questions in the end term examination question paper.
- Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 15 marks.
- Apart from Question No. 1, the rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, students may be asked to attempt only 1 question from each unit. Each question should be 15 marks.
- The questions are to be framed keeping in view the learning outcomes of course/paper. The standard/ level of the questions to be asked should be at the level of the prescribed textbooks.
- The requirement of (scientific) calculators/ log-tables/ data-tables may be specified if required.

Course Outcomes [Bloom's Knowledge Level (KL)]:

CO1	Understand the basic concepts of analog communication system [**K1, K2]**
CO2	Evaluate the performance of fundamental blocks constituting various angle modulation techniques. **[K1, K2, K3, K4, K5]**
CO3	Apply the principles of sampling in deriving different pulse modulation approaches and digital modulation techniques for optimal reception.[**K1, K2, K3]**
CO4	Understand about the basic concept of Communication Networks. **[K1, K2]**

CO/PO	**PO01**	**PO02**	**PO03**	**PO04**	**PO05**	**PO06**	**PO07**	**PO08**	**PO09**	**PO10**	**PO11**	**PO12**
CO1	3	2	-	-	1	-	-	-	-	-	-	2
CO2	3	2	-	-	1	-	-	-	-	-	-	2
CO3	3	3	3	-	-	-	-	-	-	1	2	2
CO4	3	2	-	3	-	-	-	-	-	-	-	-

Course Content	**No of lectures**

Unit I **Amplitude Modulation:** Need for modulation, Amplitude Modulation - Generation of AM waves, frequency discrimination and Phase discrimination methods for generating SSB, Demodulation of SSB Waves, principle of Vestigial sideband modulation.	[10]
Unit II **Angle Modulation:** Angle Modulation fundamentals, Frequency Modulation – Modulation index and sidebands, Narrowband FM, Wideband FM, Principles of Phase Modulation, Frequency Modulation verses Amplitude Modulation, FM demodulation	[10]
Unit III **Pulse Modulation:** Types of Pulse modulation- PAM, PWM and PPM. Comparison of FDM and TDM**.** **Pulse Code Modulation:** PCM Generation and Reconstruction, Quantization Noise, Non-Uniform Quantization and Companding, DPCM, Adaptive DPCM, DM and Adaptive DM**.**	[10]
Unit IV **Digital Modulation Techniques:** ASK- Modulator, Coherent ASK Detector, FSK- Modulator, Non- Coherent FSK Detector, BPSK- Modulator, Coherent BPSK Detection. Principles of QPSK, Differential PSK and QAM.	[10]

Text Books:

[T1] J. G. Proakis and M. Salehi, *"Fundamentals of Communication Systems,"* Prentice Hall, 2004.
[T2] S. Haykin, *"Communication Systems,"* John Wiley & Sons, 5th Ed., 2009.

Reference Books:

[R1] B.P. Lathi and Z. Ding, *Modern Digital and Analog Communication Systems*, 4th Ed., Oxford University Press, 2009.
[R2] Louis E. Frenzel, *Principles of Electonic Communication Systems*, 3rd Ed., Tata McGraw-Hill, 2008.
[R3] Dennis Roddy and John Coolen, *Electronic Communications*," 4th Ed., Pearson, 2008.

Paper Code: ARI 309	L	T/P	Credits
Subject : Software Engineering	4	-	4

Marking Scheme:
Teachers Continuous Evaluation: As per university examination norms from time to time.
End Term Theory Examination: As per university examination norms from time to time.

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks: As per University Norms

- There should be 9 questions in the end term examination question paper
- Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions.
- Apart from Question No. 1, the rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, students may be asked to attempt only 1 question from each unit.
- The questions are to be framed keeping in view the learning outcomes of course/paper. The standard/ level of the questions to be asked should be at the level of the prescribed textbooks.
- The requirement of (scientific) calculators/ log-tables/ data-tables may be specified if required

Course Outcomes [Bloom's Knowledge Level (KL)]:
CO1: Student will be able to understand the concepts of Software Engineering.**[K1, K2, K3]**
CO2: Capability to perform requirement analysis and project planning of software systems. **[K2, K3]**
CO3: Student would be able to meet and understand the design and reliability of software systems**.[K1, K2, K4]**
CO4: Student would be able software testing techniques and software maintenance. **[K2, K3,K4]**

CO/PO	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO1	3	3	3	3	2	-	-	-	1	1	1	2
CO2	3	3	3	3	2	-	-	-	1	2	1	2
CO3	3	3	3	3	2	-	-	-	1	1	1	3
CO4	3	3	3	3	3	2	-	-	1	1	1	3

Course Content	**No of lectures**
Unit I **Introduction:** Software Engineering Paradigms. Software processes and its models (waterfall, Increment Process Models, Prototype Model, RAD, Spiral Model, Rational Unified Process) Agile Development model, plan driven vs agile model of development, agile methods and development techniques (user stories, refactoring, test first development, pair programming, agile project management (SCRUM agile method).	[10]
Unit II **Searching:** Searching for solutions, Uninformed search strategies-Breadth first search, depth first search, depth first iterative deepening, bidirectional search. Heuristic search strategy-Hill	[10]

climbing,best first search, A*, AO* algorithms. Game Playing- Adversarial search, Games, Mini-max algorithm, alpha-beta pruning. Local search algorithms and optimization problems.	
Unit III **Knowledge representation:** Approaches in knowledge representation, Issues in knowledge representation, Predicate logic, propositional logic, Procedural versus declarative knowledge, Logic programming, forward versus backward reasoning, resolution **Symbolic reasoning under uncertainty:** Non monotonic reasoning, Logic for non-monotonic reasoning **Statistical reasoning:** Certainty factors & rule-based systems, Probability & Bayes' theorem, Bayesian networks, Dempster-Shafer-Theory.	[10]
Unit IV **Advance topics in Artificial Intelligence:** Introduction to neural network, Fuzzy logic and Expert systems, Genetic algorithms, Introduction to natural language processing (NLP), Introduction to nature inspired computing-ACO, ABC algorithms.	[10]

Text Books:

[T1] Russel S., Norvig P. (2003). Artificial Intelligence-A Modern Approach. Second Edition. Pearson Education.

[T2] Elaine R. Kevin K. (2009). Artificial Intelligence. Tata McGraw Hill.

Reference Books:

[R1] N. J. Nilsson, (1982) Principles of AI, Narosa Publ. House.

[R2] Ross T. J. (1995), Fuzzy Logic with Engineering Application. McGraw Hill.

[R3] S.N. Sivanandam, S.N. Deepa, (2018) Principles of Soft Computing, 3rd Edition, Wiley India.

Paper code : ARI 315	L	T/P	Credits
Subject : Operating Systems	4	0	4

Marking Scheme:
Teachers Continuous Evaluation: As per university examination norms from time to time.
End Term Theory Examination: As per university examination norms from time to time.

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks: As per University Norms

- ➢ There should be 9 questions in the end term examination question paper
- ➢ Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions.
- ➢ Apart from Question No. 1, the rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, students may be asked to attempt only 1 question from each unit.
- ➢ The questions are to be framed keeping in view the learning outcomes of course/paper. The standard/ level of the questions to be asked should be at the level of the prescribed textbooks.
- ➢ The requirement of (scientific) calculators/ log-tables/ data-tables may be specified if required

Course Outcomes [Bloom's Knowledge Level (KL)]:

CO1	To learn and understand the basic concepts of Operating System and memory management. **[K1,K2**]
CO2	To apply the concept of process management. **[K3]**
CO3	To describe the concept of device management. **[K2]**
CO4	To understand the concept of virtualization. **[K2]**

CO/ PO	**PO01**	**PO02**	**PO03**	**PO04**	**PO05**	**PO06**	**PO07**	**PO08**	**PO09**	**PO10**	**PO11**	**PO12**
CO1	3	3	3	3	1	-	-	-	-	-	1	2
CO2	3	3	3	3	1	2	-	-	-	-	1	2
CO3	3	3	3	3	1	2	-	-	-	1	2	3
CO4	3	3	3	3	1	2	-	-	-	2	2	3

Course Content	**No. of Lectures**

Unit I **Introduction:** Introduction: What is an Operating System, Simple Batch Systems, Multiprogrammed Batches systems, TimeSharing Systems, Personal-computer systems, Parallel systems, Distributed Systems, Real-Time Systems, OS – A Resource Manager. **Processes:** Introduction, Process states, process management, Interrupts, Interprocess Communication **Threads:** Introduction, Thread states, Thread Operation, Threading Models. Processor Scheduling: Scheduling levels, preemptive vs nonpreemptive scheduling, priorities, scheduling objective, scheduling criteria, scheduling algorithms, demand scheduling, real time scheduling. **Process Synchronization:** Mutual exclusion, software solution to Mutual exclusion problem, hardware solution to Mutual exclusion problem, semaphores, Critical section problems. Case study on Dining philosopher problem.	[10]
Unit II **Memory Organization & Management:** Memory Organization, Memory Hierarchy, Memory Management Strategies, Contiguous versus non- Contiguous memory allocation, Partition Management Techniques, Logical versus Physical Address space, swapping, Paging, Segmentation, Segmentation with Paging **Virtual Memory**: Demand Paging, Page Replacement, Page-replacement Algorithms, Performance of Demand Paging, Thrashing, Demand Segmentation, and Overlay Concepts	[10]
Unit III **Deadlocks:** Examples of deadlock, resource concepts, necessary conditions for deadlock, deadlock solution, deadlock prevention, deadlock avoidance with Bankers algorithms, deadlock detection, deadlock recovery. **Device Management:** Disk Scheduling Strategies, Rotational Optimization, System Consideration, Caching and Buffering **File System:** Introduction, File Organization, Logical File System, Physical File System , File Allocation strategy, Free Space Management, File Access Control, Data Access Techniques, Data Integrity Protection.	[10]
Unit IV **Virtualization :** Introduction to Virtualization, Virtual Machine, Type of virtualization, Hypervisors	[10]

Text Books:

[T1] Deitel, H. M. (1990). *An introduction to operating systems*. Addison-Wesley Longman Publishing Co., Inc..

[T2] Silberschatz, A., Galvin, P. B., & Gagne, G. (2006). *Operating system concepts*. John Wiley & Sons.

[T3] Portnoy, M. (2012). *Virtualization essentials* (Vol. 19). John Wiley & Sons.

Reference Books:

[R1] Tannenbaum (2000).*Operating Systems*. PHI, 4th Edition.

[R2] Godbole, A. S. (2005). *Operating systems*. Tata McGraw-Hill Education.

[R3] Dhamdhere, D. M. (2006). *Operating systems: a concept-based approach*, 2E. Tata McGraw-Hill Education.

Paper Code: **HSAI 302 (AIDS & AIML) /** **HSAR 301 (AR & IIOT)**	L	T/P	Credits
Subject: Elements of Indian History for Engineers	2	0	2

Marking Scheme:

Teachers Continuous Evaluation: As per university examination norms in NUES mode from time to time.

End Term Theory Examination: As per university examination norms in NUES mode from time to time.

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : As per University norms

- There should be 9 questions in the end term examination question paper
- Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions.
- Apart from Question No. 1, the rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, students may be asked to attempt only 1 question from each unit.
- The questions are to be framed keeping in view the learning outcomes of course/paper. The standard/ level of the questions to be asked should be at the level of the prescribed textbooks.
- The requirement of (scientific) calculators/ log-tables/ data-tables may be specified if required

Course Content	**No. of Lectures**
Unit I Science and Technology in Ancient India: Astronomy (Surya-Siddhanta, Aryabhatta, Varahamihira), Mathematics, Agriculture, *Shilpa-shastra* and Architecture, Physics and Chemistry, Medicine (Ayurveda), Metallurgy, Textile Production, Shipbuilding and Armaments.	[6]
Unit II Science and Technology in Medieval India: Geometry, Trigonometry and Algebra, Architecture, Agriculture (Canals and other irrigation systems), Graeco-Arabic Medicine (Unani-tibb)), Astronomy, medicine, textile, arms-making, shipbuilding and horticulture.	[6]
Unit III Modern Science in India: Surveys, Scientific Education, Scientific Societies, Growth of Scientific Institutions in colonial India, Indian Response.	[6]
Unit IV **Post-Independence India:** Policies in Science and Technology in independent India (IITS, Council of Scientific and Industrial Research, Ministry of Science and Technology), Indian Council of Agricultural Research (1947), Indian Council of Medical Research (1949), DRDO and Defence Technology, TIFR and Department of Atomic Energy and Nuclear Energy, ISRO and Space Programme (Satellite and Communication Revolution), Digital India (IT Revolution and computerization of Indian Railways), C-DOT and Telecom Advancement.	[6]

Reference Books:

[R1] D.M. Bose, S.N. Sen & B.V. Subbarayappa (Eds.), *A Concise History of Science in India*, New Delhi: Indian National Science Academy, 1971

[R2] David Arnold, *The New Cambridge History of India, III-5 (Science Technology and Medicine in Colonial India*, Cambridge: Cambridge University Press, 2004
[R3] Suvobrata Sarkar (Ed.), *History of Science, Technology, Environment and Medicine in India*, London and New York: Routledge (Taylor & Francis), 2022
[R4] Deepak Kumar, *Science and the Raj: A Study of British India*, Oxford Scholarship Online, October 2012.
[R5] P. Rama Rao, 'Science and Technology in Independent India: Retrospect and Prospect', in *Current Science*, Vol. 74, No.5, 10 March 1998, pp.418-432
[R6] A.L. Basham, *The Wonder That was India*, Vol. I, New Delhi: Rupa & Co., 1981 (Only Chapter VIII: The Arts and the Appendices: Astronomy, The Calendar, Mathematics, Physics and Chemistry, Physiology and Medicine, Logic and Epistemology, Weights and Measures, Coinage)
[R7] S.A.A. Rizvi, *The Wonder That was India*, Vol. II, London: Sidgwick & Jackson, 1987 (Chapter VII; Fine Arts-only on Monuments, Architecture and Painting for Geometry, etc.) M.S. Khan, 'Science and Technology in Early Medieval India', in https://dergipark.org.tr/tr/download/article-file/688183

Paper Code: **MSAI 304 (AIDS & AIML) /** **MSAR 303 (AR & IIOT)**	L	T/P	Credits
Subject: Entrepreneurship Mindset	2	0	2

Marking Scheme:

Teachers Continuous Evaluation: As per university examination norms in NUES mode from time to time.

End Term Theory Examination: As per university examination norms in NUES mode from time to time.

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : As per University norms

- There should be 9 questions in the end term examination question paper
- Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions.
- Apart from Question No. 1, the rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, students may be asked to attempt only 1 question from each unit.
- The questions are to be framed keeping in view the learning outcomes of course/paper. The standard/ level of the questions to be asked should be at the level of the prescribed textbooks.
- The requirement of (scientific) calculators/ log-tables/ data-tables may be specified if required

Course Content	**No. of Lectures**
Unit I **Introduction: The Entrepreneur:** Theories of Entrepreneurship; Characteristics of successful entrepreneurs, myths of entrepreneurship: entrepreneurial mindset- creativity (steps to generate creative ideas, developing creativity) and innovation (types of Innovation)	[6]
Unit II **Promotion of a Venture and Writing a business plan:** Opportunity Analysis; External Environment Analysis Economic, Social and Technological Analysis. Business plan- What is business plan, parts of a business plan. Writing a Business Plan.	[6]
Unit III **Entrepreneurship Support:** Entrepreneurial Development Programmes (EDP): EDP. Role of Government in Organizing EDPs. Institutions supporting small business enterprises: central level, state level, other agencies, industry associations.	[6]
Unit IV **Practicals:** Presenting a business plan Project on Startup India or any other government policy on entrepreneurship Discussion on why Startup fails, role of MSME etc. Discussion on role of entrepreneur in economic growth Discussion on technology park Case study discussion on successful Indian entrepreneurs.	[6]

Reference Books:

[R1] Charantimath Entrepreneurship Development and Small Business Enterprise, Pearson

[R2] Bamford C.E-Entrepreneurship: A Small Business Approach, McGraw Hill Education.

[R3] Hisrich et al-Entrepreneurship. McGraw Hill Education
[R4] Balaraju, Theduri- Entrepreneurship Development: An Analytical Study. Akansha Publishing House.
[R5] David, Otis- A Guide to Entrepreneurship, Jaico Books Publishing House, Delhi.
[R6] Kaulgud, Aruna- Entrepreneurship Management. Vikas Publishing.

Paper Code: ARO 375	L	T/P	Credits
Subject: Analysis and Design of Algorithm	3	0	3

Marking Scheme:
Teachers Continuous Evaluation: As per university examination norms from time to time.
End Term Theory Examination: As per university examination norms from time to time.

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : AS per University norms

- There should be 9 questions in the end term examination question paper
- Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions.
- Apart from Question No. 1, the rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, students may be asked to attempt only 1 question from each unit.
- The questions are to be framed keeping in view the learning outcomes of course/paper. The standard/ level of the questions to be asked should be at the level of the prescribed textbooks.
- The requirement of (scientific) calculators/ log-tables/ data-tables may be specified if required

Course Outcomes [Bloom's Knowledge Level (KL)]:
CO1: Ability of students to understand and evaluate the concepts complexity of algorithm and types of sorting algorithm **[K1, K5].**
CO2: Ability of students to understand and apply the concept of Dynamic Programming **[K2, K3].**
CO3: Ability of students to analyze the Greedy Algorithms **[K4].**
CO4: Ability of students to understand the concept of NP-Complete Problem **[K2].**

CO/PO	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO1	3	3	3	3	2	-	-	-	-	1	1	2
CO2	3	3	3	3	2	-	-	-	-	1	1	2
CO3	3	3	3	3	2	-	-	-	-	1	1	3
CO4	3	3	3	3	2	-	-	-	-	1	1	3

Course Content	**No of lectures**
Unit I Asymptotic notations for time and space complexity, Big-Oh notation, Θ notation, Ω notation, the little-oh notation, the little-omega notation, Recurrence relations: iteration method, recursion tree method, substitution method, master method, Data Structures for Disjoint Sets,. Complexity analysis, Insertion sort, Merge Sort, Quick sort. Strassen's algorithm for Matrix Multiplications.	[10]

Unit II Ingredients of Dynamic Programming, emphasis on optimal substructure , overlapping substructures, memorization. Matrix Chain Multiplication, Longest common subsequence and optimal binary search trees problems, 0-1 knapsack problem, Binomial coefficient computation through dynamic programming. Floyd Warshall algorithm.	[10]
Unit III Greedy Algorithms: Elements of Greedy strategy, overview of local and global optima, matroid, Activity selection problem, Fractional Knapsack problem, Huffman Codes, A task scheduling problem. Minimum Spanning Trees: Kruskal's and Prim's Algorithm, Single source shortest path: Dijkstra and Bellman Ford Algorithm.	[10]
Unit IV The naïve String Matching algorithm, The Rabin-Karp Algorithm, String Matching with finite automata, The Knuth-Morris Pratt algorithm.	[8]

Text Books:

[T1] Cormen, T. H., Leiserson, C. E., Rivest, R. L., & Stein, C. (2022). *Introduction to algorithms. MIT press.*

[T2] Kleinberg, J., & Tardos, E. (2006). *Algorithm design*. Pearson Education India.

Reference Books:

[R1] Baase, S. (2009). *Computer algorithms: introduction to design and analysis*. Pearson Education India.