DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

M.E. COMPUTER SCIENCE AND ENGINEERING

CURRICULUM & SYLLABI

Regulations 2020

(Applicable to candidates admitted in the Academic Year 2020 - 2021)

K.S.R. College of Engineering (Autonomous)

(Approved by AICTE, accredited by NAAC with A++ grade & affiliated to Anna University)

K.S.R. Kalvi Nagar, Tiruchengode – 637 215

Namakkal (Dt), Tamil Nadu, India

Email: info@ksrce.ac.in Website: www.ksrce.ac.ins

K.S.R. COLLEGE OF ENGINEERING: TIRUCHENGODE - 637 215 (Autonomous)

DEPARTMENT OF COMPUTER SCIENCE AND ENIGNEERING

M.E - COMPUTER SCIENCE AND ENIGNEERING

(REGULATIONS 2020)

Vision of the Institution

IV	We envision to achieve status as an excellent Educational Institution in the global knowledge hub, making self-learners, experts, ethical and responsible engineers, technologists, scientists, managers, administrators and entrepreneurs who will significantly contribute to research and environment friendly sustainable growth of the nation and the world.

Mission of the Institution

IM 1	To inculcate in the students self-learning abilities that enable them to become competitive and considerate engineers, technologists, scientists, managers, administrators and entrepreneurs by diligently imparting the best of education, nurturing environmental and social needs.
IM 2	To foster and maintain mutually beneficial partnership with global industries and Institutions through knowledge sharing, collaborative research and innovation.

Vision of the Department / Programme: (Computer Science and Engineering)

DV	To create ever green professionals for software industry, academicians for knowledge cultivation and researchers for contemporary society modernization.

Mission of the Department / Programme: (Computer Science and Engineering)

DM 1	To produce proficient design, code and system engineers for software development.
DM 2	To keep updated contemporary technology and fore coming challenges for welfare of the society.

Programme Educational Objectives (PEOs): (Computer Science and Engineering)

The graduates of the programme will be able to	
PEO 1	**Engineering knowledge:** Apply the necessary mathematical tools and fundamental & advanced knowledge of computer science & engineering.
PEO 2	**Development of solutions:** Develop computer/software/network systems understanding the importance of social, business, technical, environmental, and human context in which the systems would work.
PEO 3	**Individual and Teamwork:** Contribute effectively as a team member/leader, using common tools and environment, in computer science and engineering projects, research, or education.

Programme Outcomes (POs) of M.E. - Computer Science and Engineering

PO1	**M.E Computer Science and Engineering graduates will be able to attain:** An ability to independently carry out research /investigation and development work to solve practical problems.
PO2	An ability to write and present a substantial technical report/document.
PO3	Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program.
PSO1	**Computer System Design:** Apply the knowledge of computer system design principles in building system software and hardware components.
PSO2	**Solve Computational Problems:** Apply the theoretical foundations of computer science in modeling and developing solutions to the real-world problems.

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Department	Department of Computer Science and Engineering
Programme	M.E - Computer Science and Engineering

SEMESTER - I

Sl.No.	Course Code	Course Name	Hours/ Week			Credit	Maximum Marks		
			L	T	P	C	CA	ES	Total
THEORY									
1.	MA20133	Statistics and Operations Research	3	0	0	3	30	70	100
2.	CS20111	Advanced Data Structures	3	0	0	3	30	70	100
3.	CS20112	Research Methodology and IPR	2	0	0	2	30	70	100
4.		Professional Elective - I	3	0	0	3	30	70	100
5.		Professional Elective - II	3	0	0	3	30	70	100
PRACTICAL									
6.	CS20121	Advanced Data Structures Laboratory	0	0	3	2	50	50	100
7.	CS20122	Cloud Computing Laboratory	0	0	3	2	50	50	100
		Total	**14**	**0**	**6**	**18**	**700**		

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Department	Department of Computer Science and Engineering
Programme	M.E - Computer Science and Engineering

SEMESTER - II

Sl.No.	Course Code	Course Name	Hours/ Week			Credit	Maximum Marks		
			L	T	P	C	CA	ES	Total
THEORY									
1.	CS20211	Advanced Algorithms	3	0	0	3	30	70	100
2.	CS20212	Soft Computing	3	0	0	3	30	70	100
3.		Professional Elective - III	3	0	0	3	30	70	100
4.		Professional Elective - IV	3	0	0	3	30	70	100
PRACTICAL									
5.	CS20221	Advanced Algorithms Laboratory	0	0	3	2	50	50	100
6.	CS20222	Big Data and Analytics Laboratory	0	0	3	2	50	50	100
7.	CS20223	Technical Presentation	0	0	3	2	50	50	100
		Total	**12**	**0**	**9**	**18**	**700**		

KSR College of Engineering	**K.S.R. COLLEGE OF ENGINEERING (Autonomous)** **(Approved by AICTE & Affiliated to Anna University)** **K.S.R. Kalvi Nagar, Tiruchengode - 637 215**	**CURRICULUM** **PG** **R - 2020**

Department	Department of Computer Science and Engineering
Programme	M.E - Computer Science and Engineering

SEMESTER - III

Sl.No.	Course Code	Course Name	Hours/ Week			Credit	Maximum Marks		
			L	T	P	C	CA	ES	Total
THEORY									
1.		Professional Elective - V	3	0	0	3	30	70	100
2.		Professional Elective - VI	3	0	0	3	30	70	100
3.		Audit course	2	0	0	0	50	50	100
PRACTICAL									
4.	CS20321	Project Phase – I	0	0	20	10	50	50	100
Total			**8**	**0**	**20**	**16**	**400**		

SEMESTER - IV

Sl.No.	Course Code	Course Name	Hours/ Week			Credit	Maximum Marks		
			L	T	P	C	CA	ES	Total
PRACTICAL									
1.	CS20421	Project Phase – II	0	0	32	16	50	50	100
Total			**0**	**0**	**32**	**16**	**100**		

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Department	Department of Computer Science and Engineering
Programme	M.E - Computer Science and Engineering

List of Electives

PROFESSIONAL ELECTIVES – I and II (SEMESTER – I)

Sl.No.	Course Code	Course Name	Hours/ Week			Credit	Maximum Marks		
			L	T	P	C	CA	ES	Total
1.	CS20161	Machine Learning Techniques	3	0	0	3	30	70	100
2.	CS20162	Wireless Sensor Networks	3	0	0	3	30	70	100
3.	CS20163	Intelligent Systems	3	0	0	3	30	70	100
4.	CS20164	Data Science	3	0	0	3	30	70	100
5.	CS20165	Distributed Systems	3	0	0	3	30	70	100
6.	CS20166	Digital Image Processing and Pattern Recognition	3	0	0	3	30	70	100
7.	CS20167	Cloud Computing	3	0	0	3	30	70	100
8.	CS20168	Multicore Architectures	3	0	0	3	30	70	100
9.	CS20169	Advanced Database Technology	3	0	0	3	30	70	100
10.	CS20171	Advanced Wireless and Mobile Networks	3	0	0	3	30	70	100

PROFESSIONAL ELECTIVES – III and IV (SEMESTER – II)									
Sl.No.	**Course Code**	**Course Name**	**Hours/ Week**			**Credit**	**Maximum Marks**		
			L	**T**	**P**	**C**	**CA**	**ES**	**Total**
1.	CS20261	Data Preparation and Analysis	3	0	0	3	30	70	100
2.	CS20262	Secure Software Design and Enterprise Computing	3	0	0	3	30	70	100
3.	CS20263	Computer Vision	3	0	0	3	30	70	100
4.	CS20264	Human and Computer Interaction	3	0	0	3	30	70	100
5.	CS20265	Digital Forensics	3	0	0	3	30	70	100
6.	CS20266	Advanced Operating systems	3	0	0	3	30	70	100
7.	CS20267	Fault Tolerant Systems	3	0	0	3	30	70	100
8.	CS20268	Big Data and Analytics	3	0	0	3	30	70	100
9.	CS20269	Cognitive Science	3	0	0	3	30	70	100
10.	CS20271	Information Retrieval Techniques	3	0	0	3	30	70	100

PROFESSIONAL ELECTIVES – V and VI (SEMESTER – III)									
Sl.No.	**Course Code**	**Course Name**	**Hours/ Week**			**Credit**	**Maximum Marks**		
			L	**T**	**P**	**C**	**CA**	**ES**	**Total**
1.	CS20361	Mobile Applications and Services	3	0	0	3	30	70	100
2.	CS20362	Compiler for high performance computing	3	0	0	3	30	70	100
3.	CS20363	Optimization Techniques	3	0	0	3	30	70	100
4.	CS20364	Internet of Things	3	0	0	3	30	70	100
5.	CS20365	Ethical Hacking	3	0	0	3	30	70	100
6.	CS20366	Web Technology	3	0	0	3	30	70	100
7.	CS20367	Cost Management of Engineering Projects	3	0	0	3	30	70	100
8.	CS20368	Information Security	3	0	0	3	30	70	100
9.	CS20369	Social Network Analysis	3	0	0	3	30	70	100
10.	CS20371	Object Oriented Software Engineering	3	0	0	3	30	70	100

AUDIT COURSE (SEMESTER – III)									
Sl.No.	**Course Code**	**Course Name**	**Hours/ Week**			**Credit**	**Maximum Marks**		
			L	**T**	**P**	**C**	**CA**	**ES**	**Total**
1.	CS203A1	English for Research Paper Writing	2	0	0	0	50	50	100
2.	CS203A2	Disaster Management	2	0	0	0	50	50	100
3.	CS203A3	Value Education	2	0	0	0	50	50	100
4.	CS203A4	Constitution of India	2	0	0	0	50	50	100

Total Number of Credits: 68

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3.	CS20112	Research Methodology and IPR	2	0	0	2	40	60	100
4.		Professional Elective - I	3	0	0	3	40	60	100
5.		Professional Elective - II	3	0	0	3	40	60	100
PRACTICAL									
6.	CS20121	Advanced Data Structures Laboratory	0	0	3	2	60	40	100
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SEMESTER - II

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			L	T	P	C	CA	ES	Total
THEORY									
1.	CS20211	Advanced Algorithms	3	0	0	3	40	60	100
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Sl.No.	Course Code	Course Name	Hours/ Week			Credit	Maximum Marks		
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THEORY									
1.		Professional Elective - V	3	0	0	3	40	60	100
2.		Professional Elective - VI	3	0	0	3	40	60	100
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Total			**8**	**0**	**20**	**16**	**400**		

SEMESTER - IV

Sl.No.	Course Code	Course Name	Hours/ Week			Credit	Maximum Marks		
			L	T	P	C	CA	ES	Total
PRACTICAL									
1.	CS20421	Project Phase – II	0	0	32	16	60	40	100
Total			**0**	**0**	**32**	**16**	**100**		

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6.	CS20166	Digital Image Processing and Pattern Recognition	3	0	0	3	40	60	40
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8.	CS20168	Multicore Architectures	3	0	0	3	40	60	40
9.	CS20169	Advanced Database Technology	3	0	0	3	40	60	40
10.	CS20171	Advanced Wireless and Mobile Networks	3	0	0	3	40	60	40

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7.	CS20267	Fault Tolerant Systems	3	0	0	3	40	60	100
8.	CS20268	Big Data and Analytics	3	0	0	3	40	60	100
9.	CS20269	Cognitive Science	3	0	0	3	40	60	100
10.	CS20271	Information Retrieval Techniques	3	0	0	3	40	60	100

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Sl.No.	**Course Code**	**Course Name**	**Hours/ Week**			**Credit**	**Maximum Marks**		
			L	**T**	**P**	**C**	**CA**	**ES**	**Total**
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2.	CS20362	Compiler for high performance computing	3	0	0	3	40	60	100
3.	CS20363	Optimization Techniques	3	0	0	3	40	60	100
4.	CS20364	Internet of Things	3	0	0	3	40	60	100
5.	CS20365	Ethical Hacking	3	0	0	3	40	60	100
6.	CS20366	Web Technology	3	0	0	3	40	60	100
7.	CS20367	Cost Management of Engineering Projects	3	0	0	3	40	60	100
8.	CS20368	Information Security	3	0	0	3	40	60	100
9.	CS20369	Social Network Analysis	3	0	0	3	40	60	100
10.	CS20371	Object Oriented Software Engineering	3	0	0	3	40	60	100

AUDIT COURSE (SEMESTER – III)									
Sl.No.	**Course Code**	**Course Name**	**Hours/ Week**			**Credit**	**Maximum Marks**		
			L	**T**	**P**	**C**	**CA**	**ES**	**Total**
1.	CS203A1	English for Research Paper Writing	2	0	0	0	60	40	100
2.	CS203A2	Disaster Management	2	0	0	0	60	40	100
3.	CS203A3	Value Education	2	0	0	0	60	40	100
4.	CS203A4	Constitution of India	2	0	0	0	60	40	100

Total Number of Credits: 68

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER – I

MA20133	**STATISTICS AND OPERATIONS RESEARCH**	L	T	P	C
		3	0	0	3

Course Outcomes: **Upon Completion of the course, the students should be able to**		***Cognitive Level***
CO1:	*Finding the inference of the samples by using various methods in testing of hypothesis.*	*Apply*
CO2:	*Interpreting the variances by design of experiments to obtain inferences.*	*Apply*
CO3:	*Developing the Linear Programming concepts during the uncertain situations.*	*Understand*
CO4:	*Obtain the optimal solutions by using Transportation and Assignment problems.*	*Remember*
CO5:	*Solving the networking problems by using PERT and critical path methods.*	*Evaluate*

UNIT – I TESTING OF HYPOTHESIS [9]

Sampling distributions –Type I and Type II errors – Test of significance for attributes: test for difference between two proportions – Test of significance for small sample (Student's t- test) –Test of significance for large samples (z-test) –Test of significance of variance (F- test) – chi-square test for Independence of attributes.

UNIT – II DESIGN OF EXPERIMENTS [9]

Analysis of variance – One-way and two-way classifications – Completely randomized design – Randomized block design – Latin square design.

UNIT - III LINEAR PROGRAMMING [9]

Formation of LPP – Graphical method – Simplex method – BigM Method – Dual Simplex Method.

UNIT - IV TRANSPORTATION AND ASSIGNMENT PROBLEMS [9]

Transportation Models (Minimizing and Maximizing Problems) – Balanced and unbalanced Problems – Initial Basic feasible solution by North West Corner Rule, Least cost and Vogel's approximation methods – Optimum solution by MODI Method – Assignment Models (Minimizing and Maximizing Problems) – Balanced and Unbalanced Problems – Travelling Salesman problem.

UNIT – V PERT/CPM [9]

Network Construction – Critical Path Method – Computation of earliest start time, latest start time, Total, free and independent float time – PERT – Computation of optimistic, most likely Pessimistic and expected time – Crashing.

Total =45 Periods

Reference Books :

1 Dr. S.P. Gupta,Statistical Methods, Sultan Chand and Sons, New Delhi, Eighth Edition, 2013.

2 P.K.Gupta & Man Mohan, Operations Research, Sultan Chand & Sons, New Delhi, Twelfth Edition, 2013.

3 Gupta, S. C. and Kapoor, V. K., Fundamentals of Mathematical Statistics, Sultan Chand and Sons, New Delhi, Eight Edition, 2014.

4 Taha, H.A., Operations Research: An Introduction, Pearson Education, New Delhi, Tenth Edition, 2015.

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SEMESTER – I

CS20111	**ADVANCED DATA STRUCTURES**	L	T	P	C
		3	0	0	3

Course Outcomes: **Upon Completion of the course, the students should be able to**		***Cognitive Level***
CO1:	*Implement the symbol table using hashing techniques.*	*Create*
CO2:	*Summarize the concept of skip lists*	*Understand*
CO3:	*Develop and analyze algorithms for red-black trees, B-trees and Splay trees.*	*Analyze*
CO4:	*Design algorithms for text processing applications.*	*Create*
CO5:	*Identify suitable data structures and develop algorithms for computational geometry problems.*	*Remember*

UNIT – I DICTIONARIES AND HASHING [9]

Dictionaries: Definition – Dictionary Abstract Data Type – Implementation of Dictionaries. Hashing: Review of Hashing – Hash Function – Collision Resolution Techniques in Hashing – Separate Chaining – Open Addressing, Linear Probing – Quadratic Probing – Double Hashing – Rehashing – Extendible Hashing.

UNIT – II SKIP LISTS [9]

Skip Lists: Need for Randomizing Data Structures and Algorithms – Search and Update Operations on Skip Lists – Probabilistic Analysis of Skip Lists – Deterministic Skip Lists.

UNIT – III TREES [9]

Trees: Binary Search Trees – AVL Trees – Red Black Trees – 2-3 Trees – B-Trees–Splay Trees.

UNIT – IV TEXT PROCESSING [9]

Text Processing: Sting Operations – Brute-Force Pattern Matching – The Boyer-Moore Algorithm – The Knuth-Morris-Pratt Algorithm – Standard Tries – Compressed Tries – Suffix Tries – The Huffman Coding Algorithm – The Longest Common Subsequence Problem (LCS) – Applying Dynamic Programming to the LCS Problem.

UNIT – V COMPUTATIONAL GEOMETRY [9]

Computational Geometry: One Dimensional Range Searching – Two-Dimensional Range Searching – Constructing a Priority Search Tree – Searching a Priority Search Tree – Priority Range Trees – Quad trees – k-d Trees.

Total =45 Periods

Reference Books :

1 Mark Allen Weiss, Data Structures and Algorithm Analysis in C++, Pearson Education, New York, Fourth Edition, 2014.

2 M T Goodrich, Roberto Tamassia, Algorithm Design, John Wiley & Sons, UK, Second Edition, 2002.

3 Alfred V. Aho and John E. Hopcroft, Jeffrey D. Ullman, Data Structures and Algorithms, John Wiley & Sons, INC, UK , Sixth Edition, 2006.

4 Robert Sedgewick and Kevin Wayne, Algorithms, Pearson Education, Boston, Fourth Edition, 2010.

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SEMESTER – I

CS20112	**RESEARCH METHODOLOGY AND IPR**	L	T	P	C
		2	0	0	2

Course Outcomes : **Upon Completion of the course, the students should be able to**		***Cognitive Level***
CO1:	*Examine research problem formulation.*	*Evaluate*
CO2:	*Analyze research related information*	*Analyze*
CO3:	*Follow research ethics.*	*Understand*
CO4:	*Utilize the* Patent information and databases	*Apply*
CO5:	*Emphasis the need of information about Intellectual Property Right to be promoted among students in general and engineering in particular.*	*Understand*

UNIT – I BASCIS OF RESEARCH PROBLEM [6]

Meaning of research problem – Sources of research problem – Criteria Characteristics of a good research problem – Errors in selecting a research problem – Scope and objectives of research problem. Approaches of investigation of solutions for research problem – Data collection – Analysis – Interpretation – Necessary instrumentations.

UNIT – II TECHNICAL WRITING AND PROPOSAL [6]

Effective literature studies approaches – Analysis Plagiarism – Research ethics – Effective technical writing – How to write Report – Paper – Developing Research Proposal – Format of research proposal – Presentation and Assessment by a review committee.

UNIT – III INTELLECTUAL PROPERTY [6]

Nature of Intellectual Property: Patents – Designs –Trade and Copyright. Process of Patenting and Development: Technological research – Innovation – Patenting – Development. International Scenario: International cooperation on Intellectual Property – Procedure for grants of patents – Patenting under PCT.

UNIT – IV PATENT RIGHTS [6]

Patent Rights: Scope of Patent Rights – Licensing and transfer of technology – Patent information and databases – Geographical Indications.

UNIT – V DEVELOPMENTS IN IPR [6]

New Developments in IPR: Administration of Patent System – New developments in IPR – IPR of Biological Systems – Computer Software – Traditional knowledge Case Studies – IPR and IITs.

Total = 30 Periods

Reference Books :

1 Wayne Goddard and Stuart Melville, Research Methodology: An Introduction, Juta and Company Ltd, Lansdowne, Second Edition, 2004.
2 Ranjit Kumar, Research Methodology: A Step by Step Guide for beginners, SAGE Publications Asia-Pacific Pvt Ltd, Singapore, Third Edition, 2014.
3 Stuart Melville and Wayne Goddard, Research methodology: an introduction for science & engineering students, Juta & Co , Kenwyn, South Africa, Second Edition,1996.
4 Halbert, Resisting Intellectual Property, Taylor & Francis Ltd, London, First Edition, 2007.
5 Robert P. Merges, Peter S. Menell, Mark A. Lemley, Intellectual Property in New Technological Age, Aspen Publishers, New York, Sixth Edition 2016.
6 T. Ramappa, Intellectual Property Rights Under WTO, S. Chand, Wheeler Publishing, Hyderabad, Second Edition, 2008
7 Stuart Melville and Wayne Goddard, Research methodology: an introduction for science & engineering students, Lansdowne ,Juta and Company Ltd, First Edition, 1996.

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SEMESTER – I

CS20121	**ADVANCED DATA STRUCTURES LABORATORY**	L	T	P	C
		0	0	3	2

Course Outcomes: On Completion of this course , the student will be able to		***Cognitive level***
CO1:	*Implement basic sorting algorithms.*	*Create*
CO2:	*Design various searching techniques.*	*Create*
CO3:	*Construct advanced tree structures.*	*Apply*
CO4:	*Analyze the* various *string operations*	*Analyze*
CO5:	*Evaluation of compression techniques*	*Evaluate*

List of Experiments

1. Implementation of Merge Sort and Quick Sort Analysis.
2. Implementation of Separate Chaining in hashing.
3. Implementation of Linear Probing in hashing.
4. Implementation of Binary Search Tree.
5. Implementation of AVL Tree.
6. Implementation of Red-Black Tree.
7. Implementation of Splay tree.
8. Implementation of various string operations.
9. Implementation of Matrix Chain Multiplication.
10. Implementation of Activity Selection and Huffman Coding.

Total : 45 Periods

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SEMESTER – I

CS20122	**CLOUD COMPUTING LABORATORY**	L	T	P	C
		0	0	3	2

Course Outcomes: On Completion of this course, the student will be able to		***Cognitive level***
CO1:	Install the various hypervisors and VMs	*Apply*
CO2:	*Run their application on the instantiated VMs over different hypervisors.*	*Understand*
CO3:	*Simulate their sample proposed systems.*	*Analyze*
CO4:	*Setup a private cloud with open source cloud tools and deploy simple cloud services.*	*Evaluating*
CO5:	*Develop MapReduce application using Hadoop setup.*	*Creating*

LIST OF EXPERIMENTS:

1. a) Installation of various hypervisors and instantiation of VMs with image file using open source hypervisors such as Virtual Box, VMWare Player, Xen and KVM.
   b) Client server communication between two virtual machine instances, execution of chat application.
2. Creation of simple network topology using open source network virtualization tools (like mini net and others).
3. Implementation of simple network protocols using open source network controllers (like Open Daylight).
4. Implementation of various scheduling mechanisms using open source cloud simulator.
5. Familiarization and usage of the following cloud services with open source cloud tools(like Eucalyptus, Open stack, Open Nebula and others)
   a) Scheduling mechanisms
   b) Load balancing mechanisms
   c) Hashing and encryption mechanisms
6. Familiarization and usage of collaborative applications (SaaS).
7. Implementing applications using Google App Engine (PaaS).
   a) Develop MapReduce application (example-URL Pattern count and others) using Hadoop cluster set up (Single node and multi node).

Total : 45 Periods

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SEMESTER – II

CS20211	**ADVANCED ALGORITHMS**	L	T	P	C
		3	0	0	3

Course Outcomes : **Upon Completion of the course, the students should be able to**		***Cognitive Level***
CO1:	*Analyze the complexity/performance of different algorithms.*	*Analyze*
CO2:	*Determine the appropriate data structure for solving a particular set of problems.*	*Create*
CO3:	*Categorize the different problems in various classes according to their complexity.*	*Understand*
CO4:	*Have an insight of recent activities in the field of the advanced data structure.*	*Analyze*
CO5:	*Evaluate the linear programming of different algorithms*	*Evaluate*

UNIT – I SORTING AND GRAPH [9]

Sorting: Review of various sorting algorithms – Topological sorting. Graph: Definitions and Elementary Algorithms – Shortest path by BFS – Shortest path in edge-weighted case (Dijkstra's) – Depth-first search and computation of strongly connected component – Emphasis on correctness proof of the algorithm and time/space analysis.

UNIT – II MATROIDS AND GRAPH MATCHING [9]

Matroids: Introduction to greedy paradigm – Algorithm to compute a maximum weight maximal independent set – Application to MST. Graph Matching: Algorithm to compute maximum matching – Characterization of maximum matching by augmenting paths – Edmond's Blossom algorithm to compute augmenting path.

UNIT – III FLOW-NETWORKS AND MATRIX COMPUTATIONS [9]

Flow-Networks: Maxflow-mincut theorem – Ford-Fulkerson Method to compute maximum flow – Edmond-Karp maximum-flow algorithm. Matrix Computations: Strassen's algorithm and Divide and Conquer paradigm – Inverse of a triangular matrix – Relation between the time complexities of basic matrix operations – LUP-Decomposition.

UNIT – IV GRAPHS, POLYNOMIALS AND DISCRETE FOURIER TRANSFORM [9]

Shortest Path in Graphs: Floyd-Warshall algorithm and dynamic programming paradigm. More Modulo Representation of integers/polynomials: Chinese Remainder Theorem – Conversion between base-representation and modulo-representation – Extension to polynomials. Application: Interpolation problem – Discrete Fourier Transform (DFT): In complex field – DFT in modulo ring – Fast Fourier Transform algorithm – Schonhage-Strassen Integer Multiplication algorithm.

UNIT – V LINEAR PROGRAMMING [9]

Linear Programming: Geometry of the feasibility region and Simplex algorithm – NP-completeness: Examples – proof of NP-hardness and NP-completeness – Approximation algorithms – Randomized Algorithms.

Total =45 Periods

Reference Books :

1 Cormen, Leiserson, Rivest, Stein, Introduction to Algorithms, MIT Press, London, Third Edition, 2009.

2 Aho, Hopcroft, Ullman The Design and Analysis of Computer Algorithms, Kaifa Book Company, London, First Edition ,1985

3 Kleinberg and Tardos, Algorithm Design, Pearson Education London, Third Edition, 2006.

4 R. F. Gilberg, B. A. Forouzan, Data Structures, Thomson, India, Second Edition, 2005.

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SEMESTER– II

CS20212	**SOFT COMPUTING**	L	T	P	C
		3	0	0	3

Course Outcomes : **Upon Completion of the course, the students should be able to** ***Cognitive Level***

CO1:	*Outline the concepts of soft computing.*	*Understand*
CO2:	*Discuss on machine learning through neural networks.*	*Evaluate*
CO3:	*Apply knowledge in developing a Fuzzy expert system.*	*Apply*
CO4:	*Model Neuro Fuzzy system for clustering and classification.*	*Analyze*
CO5:	*Discover knowledge to develop Genetic Algorithm and Support vector machine based machine learning system.*	*Create*

UNIT – I BASICS OF SOFT COMPUTING [9]

Evolution of Computing – Soft Computing Constituents – From Conventional AI to Computational Intelligence – Machine Learning Basics

UNIT – II GENETIC ALGORITHMS [9]

Introduction to Genetic Algorithms (GA) – Applications of GA – Building Block Hypothesis – Representation – Fitness Measures – Genetic Operators – GA Based Machine Learning.

UNIT – III NEURAL NETWORKS [9]

Machine Learning using Neural Network, Adaptive Networks – Feed Forward Networks – Supervised Learning Neural Networks – Radial Basis Function Networks – Reinforcement Learning – Unsupervised Learning Neural Networks – Adaptive Resonance Architectures – Advances in Neural Networks.

UNIT – IV FUZZY LOGIC [9]

Fuzzy Sets – Operations on Fuzzy Sets – Fuzzy Relations – Membership Functions – Fuzzy Rules and Fuzzy Reasoning – Fuzzy Inference Systems – Fuzzy Expert Systems – Fuzzy Decision Making

UNIT – V NEURO-FUZZY MODELING [9]

Adaptive Neuro-Fuzzy Inference Systems – Coactive Neuro-Fuzzy Modeling – Classification and Regression Trees – Data Clustering Algorithms – Rule Based Structure Identification – Neuro-Fuzzy Control – Case Studies.

Total = 45 Periods

Reference Books :

1 S.N.Sivanandam and S.N.Deepa, Introduction to Genetic Algorithms, Springer, New York, First Edition, 2008.

2 KwangH.Lee, First course on Fuzzy Theory and Applications, Springer, New York, First Edition, 2005.

3 James A. Freeman and David M. Skapura, Neural Networks Algorithms Applications and Programming Techniques, Addison Wesley, Boston, Second Edition, 2003.

4 Mitchell Melanie, An Introduction to Genetic Algorithm, MIT Press, London, First Edition, 1996.

5 Jyh-Shing Roger Jang, Chuen-Tsai Sun, EijiMizutani, Neuro-Fuzzy and Soft Computing, Prentice-Hall of India, Second Edition, 2002.

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SEMESTER – II

CS20221	**ADVANCED ALGORITHMS LABORATORY**	L	T	P	C
		0	0	3	2

Course Outcomes: On Completion of this course the student will be able to		***Cognitive Level***
CO1:	*Summarize the different sorting and searching algorithms.*	*Remember*
CO2:	*Implement the various graph traversal methods.*	*Create*
CO3:	*Analyze the different shortest path algorithm*	*Analyze*
CO4:	*Demonstrate the extended Euclidean algorithm and modular exponentiation techniques.*	*Analyze*
CO5:	*Implement Strassen's matrix multiplication and matrix chain multiplication algorithms.*	*Create*

LIST OF EXPERIMENTS:

1. Write a menu based program for sorting algorithms.
2. Write a menu based program for searching algorithms.
3. Write a menu driven program to perform DFS and BFS.
4. Implementation of Prim's algorithm to find minimum cost spanning tree.
5. Implementation of Dijkstra's algorithm.
6. Implementation of Warshall's Algorithm.
7. Implementation of the extended Euclidean algorithm.
8. Implementation of the Modular exponentiation technique on an input data set.
9. Implementation of matrix multiplication Algorithm.
10. Implementation of Matrix Chain Multiplication.

Total : 45 Periods

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SEMESTER – II

CS20222	**BIG DATA AND ANALYTICS LABORATORY**	L	T	P	C
		0	0	3	2

Course Outcomes: On Completion of this course the student will be able to		***Cognitive Level***
CO1:	*Set up multi-node hadoop clusters*	*Understand*
CO2:	*Apply* MapReduce *algorithms for various algorithms.*	*Apply*
CO3:	*Design a new algorithm that uses* MapReduce *to apply on unstructured and structured data.*	*Create*
CO4:	*Demonstrate the page rank Computation.*	*Understand*
CO5:	*Facilitate the knowledge build up in big data analysis using Mahout Machine learning library.*	*Understand*

LIST OF EXPERIMENTS:

1. Set up a pseudo-distributed, single-node Hadoop cluster backed by the Hadoop Distributed File System, running on Ubuntu Linux. After successful installation on one node, configuration of a multi-node Hadoop cluster (one master and multiple slaves).
2. MapReduce application for word counting on Hadoop cluster
3. Unstructured data into NoSQL data and do all operations such as NoSQL query with API.
4. K-means clustering using MapReduce.
5. Page Rank Computation.
6. Mahout machine learning library to facilitate the knowledge build up in big data analysis.
7. Application of Recommendation Systems using Hadoop/mahout libraries

Total : 45 Periods

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SEMESTER – II

CS20223	TECHNICAL PRESENTATION	L	T	P	C
		0	0	3	2

Course Outcomes: On Completion of this course the student will be able to		***Cognitive Level***
CO1:	*Refer and utilize various technical resources available from multiple fields.*	*Understand*
CO2:	*Analyze the importance of intonation, word and sentence stress for improving communicative*	*Analyze*
CO3:	*Competence, identifying and overcoming problem sounds.*	*Understand*
CO4:	*Interact and share their technical knowledge to enhance the leadership skills.*	*Understand*
CO5:	*Prepare report and present oral demonstrations.*	*Understand*

Guidelines:

1. The students have to refer the journals, conference proceedings which are published recently.
2. By mutual discussions with the faculty, the student can choose a topic in specific area.
3. The student has to submit a technical report having 30 - 50 pages to the corresponding faculty one week before the final presentation.

Total : 45 Periods

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SEMESTER – III

CS20321	**PROJECT PHASE– I**	L	T	P	C
		0	0	20	10

Course Outcomes: On Completion of this course, the student will be able to		***Cognitive Level***
CO1:	*Formulate a real world problem, identify the requirement and develop the design solutions.*	*Analyze*
CO2:	*Identify technical ideas, strategies and methodologies*	*Apply*
CO3:	*Utilize the new tools, algorithms, techniques that contribute to obtain the solution of the project.*	*Create*
CO4:	*Test and validate through conformance of the developed prototype and analysis the cost effectiveness.*	*Understand*
CO5:	*Prepare report and present oral demonstrations.*	*Remembrance*

GUIDELINES:

1. Each Student can undergo project work, either Individual / Group, based on Society, Application, Software, Hardware, Research, Innovation, Industry, etc., with the guidance of reputed Journals and Articles.
2. Project Team will be supervised by subject / industrial experts based on their Area of specialization
3. Each student will undertake a sizeable project involving survey of literature.
4. Contact Hours shall be allotted in the timetable and this time shall be utilized by the students to receive the directions from the guide, on library reading, laboratory work, and computer analysis of field work as assigned by the guide and also to presenting periodical seminars on the progress made in the project.
5. The aim of the project work is to deepen comprehension of principles by applying them to a new problem which may be the design and manufacture of a device, a research investigation, a computer or management project or a design problem.
6. The student should implement and develop systems by selecting appropriate techniques based on its performance.
7. The progress of the project is evaluated based on a minimum of three reviews.
8. The student should have to write the reports under respective regulation along with the guidance of faculty members / industry experts.
9. Project Report→Number of Project report to be submitted = No. of Students in the Batch + Guide + Department Library + College Library

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SEMESTER – IV

CS20421	**PROJECT PHASE– II**	L	T	P	C
		0	0	32	16

Course Outcomes: On Completion of this course, the student will be able to		***Cognitive Level***
CO1:	*Formulate a real world problem, identify the requirement and develop the design solutions.*	*Analyze*
CO2:	*Identify technical ideas, strategies and methodologies*	*Apply*
CO3:	*Utilize the new tools, algorithms, techniques that contribute to obtain the solution of the project.*	*Create*
CO4:	*Test and validate through conformance of the developed prototype and analysis the cost effectiveness.*	*Understand*
CO5:	*Prepare report and present oral demonstrations.*	*Remember*

GUIDELINES:

1. Each Student can undergo project work, either Individual / Group, based on Society, Application, Software, Hardware, Research, Innovation, Industry, etc., with the guidance of reputed Journals and Articles.
2. Project Team will be supervised by subject / industrial experts based on their Area of specialization
3. Each student will undertake a sizeable project involving survey of literature.
4. Contact Hours shall be allotted in the timetable and this time shall be utilized by the students to receive the directions from the guide, on library reading, laboratory work, and computer analysis of field work as assigned by the guide and also to presenting periodical seminars on the progress made in the project.
5. The aim of the project work is to deepen comprehension of principles by applying them to a new problem which may be the design and manufacture of a device, a research investigation, a computer or management project or a design problem.
6. The student should implement and develop systems by selecting appropriate techniques based on its performance.
7. The progress of the project is evaluated based on a minimum of three reviews.
8. The student should have to write the reports under respective regulation along with the guidance of faculty members / industry experts.
9. Project Report→Number of Project report to be submitted = No. of Students in the Batch + Guide + Department Library + College Library

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SEMESTER – I (ELECTIVE)

CS20161	**MACHINE LEARNING TECHNIQUES**	L	T	P	C
		3	0	0	3

Course Outcomes : **Upon Completion of the course, the students should be able to**		***Cognitive Level***
CO1:	*Design a neural network for an application of your choice.*	*Understand*
CO2:	*Implement probabilistic discriminative and generative algorithms for an application of your choice and analyze the results.*	*Apply*
CO3:	*Use a tool to implement typical clustering algorithms for different types of applications.*	*Apply*
CO4:	*Design and implement an HMM for a sequence model type of application.*	*Create*
CO5:	*Identify applications suitable for different types of machine learning with suitable justification.*	*Apply*

UNIT– I **BASICS OF MACHINE LEARNING** **[9]**

Machine Learning – Machine Learning Foundations – Overview – Design of a Learning System – Types of Machine learning – Applications Mathematical foundations of Machine Learning – Random Variables and Probabilities – Probability Theory – Probability Distributions – Decision Theory – Bayes Decision Theory – Information Theory.

UNIT – II **SUPERVISED LEARNING** **[9]**

Linear Models for Regression – Linear Models for Classification – Naive Bayes – Discriminant Functions – Probabilistic Generative Models – Probabilistic Discriminative Models – Bayesian Logistic Regression – Decision Trees – Classification Trees – Regression Trees – Pruning – Neural Networks – Feed Forward Network Functions – Back-Propagation – Support vector machines – Ensemble methods – Bagging – Boosting.

UNIT – III **UNSUPERVISED LEARNING** **[9]**

Clustering – K means – EM Algorithm – Mixtures of Gaussians – Curse of Dimensionality – Dimensionality Reduction – Factor Analysis – Principal Component Analysis – Probabilistic PCA.

UNIT – IV **PROBABILISTIC GRAPHICAL MODELS** **[9]**

Graphical Models – Undirected Graphical Models – Markov Random Fields – Directed Graphical Models – Bayesian Networks – Conditional Independence Properties – Inference – Generalization – Hidden Markov Models.

UNIT – V **ADVANCED LEARNING** **[9]**

Sampling – Basic Sampling methods – Monte Carlo. Reinforcement Learning – K-Armed Bandit – Elements – Model-Based Learning – Value Iteration – Policy Iteration –Temporal Difference Learning – Exploration Strategies.

Total = 45 Periods

Reference Books :

1 Ethem Alpaydin, Introduction to Machine Learning, MIT Press, London, Third Edition, 2014.

2 Kevin P. Murphy, Machine Learning: A Probabilistic Perspective, MIT Press, London, Third Edition ,2012

3 Trevor Hastie, Robert Tibshirani and Jerome Friedman, The Elements of Statistical Learning, Springer, United States, Second Edition, 2011.

4 Christopher Bishop, Pattern Recognition and Machine Learning, Springer, United States, First Edition, 2007.

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SEMESTER – I (ELECTIVE)

CS20162	**WIRELESS SENSOR NETWORKS**	L	T	P	C
		3	0	0	3

Course Outcomes : **Upon Completion of the course, the students should be able to :**		***Cognitive Level***
CO1:	*Describe and explain radio standards and communication protocols for wireless sensor networks.*	Create
CO2:	*Explain the function of the node architecture and use of sensors for various applications.*	Understand
CO3:	*Be familiar with architectures, functions and performance of wireless sensor networks systems and platforms.*	Apply
CO4:	*Evaluate the various security mechanisms for wireless sensor networks.*	Evaluate
CO5:	*Analyze the different routing protocols for wireless sensor networks*	Analyze

UNIT – I **BASICS OF WIRELESS SENSOR NETWORKS** **[9]**

Introduction: Wireless Sensor Networks – Motivations – Applications – Performance metrics – History and Design factors. Network Architecture: Traditional layered stack – Cross-layer designs – Sensor Network Architecture. Hardware Platforms: Motes – Hardware parameters.

UNIT – II **NS-3** **[9]**

Introduction to Ns-3 – Introduction to Network Simulator 3 (Ns-3) – Description of the Ns-3 core module and simulation example.

UNIT– III **MEDIUM ACCESS CONTROL PROTOCOL DESIGN AND ANALYSIS** **[9]**

Medium Access Control Protocol design: Fixed Access – Random Access – WSN protocols: synchronized – duty-cycled. Markov Chain: Discrete time Markov Chain definition – Properties – Classification and analysis MAC Protocol Analysis: Asynchronous duty-cycled – X-MAC Analysis (Markov Chain).

UNIT –IV **SECURITY** **[9]**

Security: Possible attacks – Countermeasures – SPINS – Static and dynamic key distribution.

UNIT – V **ROUTING PROTOCOLS** **[9]**

Routing protocols: Introduction – MANET protocols. Routing protocols for WSN: Resource-aware routing – Data centric-Geographic Routing – Broadcast – Multicast. Opportunistic Routing Analysis: Analysis of opportunistic routing (Markov Chain).

Total = 45 Periods

Reference Books :

1 W. Dargie and C. Poellabauer, Fundamentals of Wireless Sensor Networks –Theory and Practice, Wiley, London, Third Edition, 2010.
2 KazemSohraby, Daniel Minoli and TaiebZnati, “Wireless sensor networks -Technology, Protocols, and Applications”, Wiley Interscience, UK, Second Edition, 2007
3 Takahiro Hara,Vladimir I. Zadorozhny, and Erik Buchmann, Wireless Sensor Network Technologies for the Information Explosion Era , springer, United States, First Edition, 2010
4 Holger Karl and Andreas Willig Protocols and Architectures for Wireless Sensor Networks, Wiley, India, Second Edition, 2005

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SEMESTER – I (ELECTIVE)

CS20163	**INTELLIGENT SYSTEMS**	L	T	P	C
		3	0	0	3

Course Outcomes : **On Completion of the course, the students will be able to**		***Cognitive Level***
CO1:	*Demonstrate knowledge of the fundamental principles of intelligent systems.*	*Apply*
CO2:	*Compare the relative merits of a variety of AI problem solving techniques.*	*Analyze*
CO3:	*Analyze the various search methods for intelligent systems..*	*Evaluate*
CO4:	*Examine idea of knowledge representation and logical inference.*	*Analyze*
CO5:	*Evaluate the concepts of reasoning under uncertainty and learning techniques on uncertainty reasoning*	*Evaluate*

UNIT – I BIOLOGICAL FOUNDATIONS TO INTELLIGENT SYSTEMS – I [9]

Biological foundations to intelligent systems I: Artificial neural networks – Back propagation networks – Radial basis function networks -- Recurrent networks.

UNIT – II BIOLOGICAL FOUNDATIONS TO INTELLIGENT SYSTEMS – II [9]

Biological foundations to intelligent systems II: Fuzzy logic – Knowledge Representation and inference mechanism – Genetic algorithm – Fuzzy neural networks.

UNIT – III SEARCH METHODS [9]

Search Methods: Basic concepts of graph and tree search. Three simple search methods: Breadth-first search – Depth-first search – Iterative deepening search. Heuristic search methods: Best-first search – Admissible evaluation functions – Hill-climbing search.

UNIT – IV KNOWLEDGE REPRESENTATION AND LOGICAL INFERENCE [9]

Knowledge representation and logical inference – Issues in knowledge representation – Structured representation: frames, scripts, semantic networks and conceptual graphs. Formal logic and logical inference – Knowledge-based systems structures – Basic components – Ideas of Blackboard architectures.

UNIT – V UNCERTAINTY AND LEARNING TECHNIQUES [9]

Reasoning under uncertainty and Learning Techniques on uncertainty reasoning: Bayesian reasoning – Certainty factors and Dempster-Shafer – Theory of Evidential reasoning – Study of different learning and Evolutionary algorithms – Statistical learning and Induction learning.

Total = 45 Periods

Reference Books :

1 Luger G.F. and Stubblefield W.A, Artificial Intelligence: Structures and strategies for Complex Problem Solving, Addison Wesley, Sixth Edition, 2008.

2 Russell S. and Norvig P, Artificial Intelligence: A Modern Approach. Prentice-Hall, New Delhi, Third Edition, 2009.

3 CrinaGrosan, Ajith Abraham, Intelligent Systems: A Modern Approach, Springer Science & Business Media, United States, Second Edition, 2011.

4 Kevin Night and Elaine Rich, Nair B., Artificial Intelligence (SIE), Tata McGraw Hill, New Delhi, Third Edition, 2008

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SEMESTER – I(ELECTIVE)

CS20164	**DATA SCIENCE**	L	T	P	C
		3	0	0	3

Course Outcomes : **On Completion of the course, the students will be able to**		***Cognitive Level***
CO1:	*Summarize the core concepts and technologies of data science.*	*Understand*
CO2:	*Explain how data is collected, managed and stored for data science.*	*Understand*
CO3:	*Analyze the data and some basic machine learning algorithms.*	*Analyze*
CO4:	*Outline the key concepts in data science, including their real-world applications and the toolkit used by data scientists*	*Analyze*
CO5:	*Implement data collection and management scripts using MongoDB*	*Create*

UNIT – I BASICS OF DATA SCIENCE [9]

Introduction to core concepts and technologies: Introduction –Terminology – Data science process –Data science toolkit – Types of data – Example applications.

UNIT – II DATA COLLECTION AND MANAGEMENT [9]

Data collection and management: Introduction – Sources of data – Data collection and APIs – Exploring and fixing data – Data storage and management – Using multiple data sources.

UNIT – III DATA ANALYSIS [9]

Data analysis: Introduction –Terminology and concepts – Introduction to statistics – Central tendencies and distributions – Variance – Distribution properties and arithmetic – Samples/CLT – Basic machine learning algorithms – Linear regression– SVM – Naive Bayes.

UNIT – IV DATA VISUALISATION [9]

Data Visualisation: Introduction – Types of data visualization – Data for Visualisation: Data types – Data encodings – Retinal variables – Mapping variables to encodings – Visual encodings.

UNIT – V APPLICATIONS [9]

Applications of Data Science – Technologies for visualization – Recent trends in various data collection and analysis techniques – Various visualization techniques.

Total = 45 Periods

Reference Books :

1 Cathy O'Neil and Rachel Schutt, Doing Data Science, Straight Talk from The Frontline. O'Reilly, Fifth Edition, 2013.
2 Jure Leskovek, Anand Rajaraman and Jeffrey Ullman, Mining of Massive Datasets v2.1, Cambridge University Press, England, Second Edition, 2014.
3 Field Cady, The Data Science Handbook, John Wiley & Sons, US, Third Edition, 2017.
4 Chirag Shah, A Hands-On Introduction to Data Science, Cambridge University Press, England, First Edition, 2020

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SEMESTER – I(ELECTIVE)

CS20165	**DISTRIBUTED SYSTEMS**	L	T	P	C
		3	0	0	3

Course Outcomes: On Completion of this course, the student will be able to		***Cognitive Level***
CO1:	*Design trends in distributed systems.*	*Understand*
CO2:	*Utilize network virtualization concepts.*	*Apply*
CO3:	*Apply remote method invocation techniques.*	*Apply*
CO4:	*Outline the concepts of concurrency control in centralized database systems and reliability*	*Understand*
CO5:	*Analyze the concepts of parallel database systems and mobile database.*	*Analyze*

UNIT – I FUNDAMENTALS OF DISTRIBUTED SYSTEMS [9]

Introduction: Distributed data processing – DDBS – Advantages and disadvantages of DDBS – Problem areas – Overview of database and computer network concepts. Distributed Database Management System architecture: Transparencies in a distributed DBMS – Distributed DBMS architecture – Global directory issues.

UNIT – II DATABASE DESIGN AND ISSUES [9]

Distributed Database Design: Alternative design strategies – Distributed design issues – Fragmentation – Data Allocation. Semantics Data Control: View management – Data security – Semantic Integrity Control. Query Processing Issues: Objectives of query processing – Characterization of query processors – Layers of query processing – Query decomposition – Localization of distributed data.

UNIT – III QUERY OPTIMIZATION AND TRANSACTION MANAGEMENT [9]

Distributed Query Optimization: Factors governing query optimization – Centralized query optimization – Ordering of fragment queries – Distributed query optimization algorithms. Transaction Management: Transaction concept – Goals of transaction management – Characteristics of transactions – Taxonomy of transaction models.

UNIT – IV CONCURRENCY CONTROL AND RELIABILITY [9]

Concurrency Control: Concurrency control in centralized database systems – Concurrency control in DDBSs – Distributed concurrency control algorithms – Deadlock management. Reliability: Reliability issues in DDBS – Types of failures – Reliability techniques – Commit protocols – Recovery protocols.

UNIT – V PARALLEL DATABASE SYSTEMS [9]

Parallel Database Systems: Parallel architectures – Parallel query processing and optimization – Load balancing. Mobile Databases – Distributed Object Management – Multi-databases.

Total = 45 Periods

Reference Books :

1 M.T. Ozsu and P. Valduriez, Principles of Distributed Database Systems, Prentice Hall, US, Third Edition, 2011.

2 D. Bell and J. Grimson, Distributed Database Systems, Addison-Wesley, Boston-US, Fourth Edition, 1992.

3 George Colouris, Jean Dollimore and Tim Kinberg, Distributed system concept and Design Pearson Education, New Delhi, Fourth Edition, 2012.

4 SunitaMahajan and Seema Shah, Distributed Computing, Oxford Higher Education, England, Third Edition, 2010.

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SEMESTER – I(ELECTIVE)

CS20166	**DIGITAL IMAGE PROCESSING AND PATTERN RECOGNITION**	L	T	P	C
		3	0	0	3

Course Outcomes: On Completion of this course, the student will be able to		***Cognitive Level***
CO1:	*Implement basic image processing algorithms using MATLAB tool.*	*Analyze*
CO2:	*Design an application that incorporates different concepts of Image processing.*	*Create*
CO3:	*Apply and explore new techniques in the areas of image enhancement, restoration, segmentation, compression and wavelet processing and image morphology.*	*Understand*
CO4:	*Critically analyze different approaches to implement mini projects.*	*Create*
CO5:	*Explore the possibility of Applying image processing concepts in various domains.*	*Understand*

UNIT – I **FUNDAMENTALS OF IMAGE PROCESSING** **[9]**

Introduction – Elements of Visual Perception, Steps in Image Processing Systems – Digital Imaging System – Image Acquisition – Sampling and Quantization – Pixel Relationships – File Formats – Colour Images and Models – Image Operations – Arithmetic, Logical, Statistical and Spatial Operations.

UNIT – II **IMAGE ENHANCEMENT AND RESTORATION** **[9]**

Image Transforms – Discrete and Fast Fourier Transform and Discrete Cosine Transform – Spatial Domain – Gray level Transformations – Histogram Processing – Spatial Filtering: Smoothing and Sharpening – Frequency Domain: Filtering in Frequency Domain – Smoothing and Sharpening Filters – Homomorphic Filtering – Noise models – Constrained and Unconstrained Restoration Models.

UNIT – III **IMAGE SEGMENTATION AND MORPHOLOGY** **[9]**

Detection of Discontinuities – Edge Operators – Edge Linking and Boundary Detection – Thresholding – Region Based Segmentation – Motion Segmentation – Image Morphology: Binary and Gray level Morphology Operations – Erosion, Dilation, Opening and Closing Operations – Distance Transforms – Basic Morphological Algorithms.

UNIT – IV **PATTERN RECOGNITION** **[9]**

Component Labeling – Image Features – Textures – Boeundary Representations and Descriptions – Regional Descriptors – Feature Selection and Feature Dimensionality Rduction – Image Classification and Recognition –Statistical Classifiers – Clustering Algorithms – Hierarchical and Partitional Clustering.

UNIT – V **IMAGE PATTERN RECOGNITION CASE STUDIES** **[9]**

Image Understanding – Case Studies in Biometrics – Video Processing – Image Fusion – Image Security – Steganography and Watermarking.

Total = 45 Periods

Reference Books :

1 S.Sridhar, Digital Image Processing, Oxford University Press, New Delhi, Second Edition, 2011.

2 Rafael C.Gonzalez and Richard E.Woods, Digital Image Processing, Pearson Education, New Delhi, Third Edition, 2008.

3 Alasdair McAndrew, Introduction to Digital Image Processing with Matlab, Cengage Learning, India, Second Edition, 2011.

4 Wilhelm Burger and Mark J Berge, Digital Image Processing: An algorithmic Introduction using Java, Springer International, New York, First Edition 2008.

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SEMESTER – I(ELECTIVE)

CS20167	**CLOUD COMPUTING**	L	T	P	C
		3	0	0	3

Course Outcomes: On Completion of this course, the student will be able to		***Cognitive Level***
CO1:	*Identify security aspects of each cloud model.*	*Analyzing*
CO2:	*Develop a risk-management strategy for moving to the cloud.*	*Creating*
CO3:	*Implement a public cloud instance using a public cloud service provider.*	*Evaluating*
CO4:	*Apply trust based security model to different layer.*	*Applying*
CO5:	*Examine the concept of audit and compliance.*	*Understanding*

UNIT – I BASICS OF CLOUD COMPUTING [9]

Online Social Networks and Applications – Cloud introduction and overview –Different clouds – Risks – Novel applications of cloud computing–Cloud Computing Architecture: Requirements – Introduction Cloud computing architecture –On Demand Computing Virtualization at the infrastructure level –Security in Cloud computing environments – CPU Virtualization – Hypervisors Storage Virtualization Cloud Computing Defined –SPI Framework for Cloud Computing – Traditional Software Mode l– Cloud Services Delivery Model.

UNIT – II CLOUD DEPLOYMENT MODELS AND SECURITY ISSUES [9]

Key Drivers to Adopting the Cloud – The Impact of Cloud Computing on Users –Governance in the Cloud – Barriers to Cloud Computing Adoption In the Enterprise. Infrastructure Security: The Network Level – The Host Level – The Application Level – Data Security and Storage – Aspects of Data Security – Data Security Mitigation Provider Data and Its Security.

UNIT – III ACCESS AND SECURITY MANAGEMENT [9]

Identity and Access Management: Trust Boundaries and IAM – IAM Challenges – Relevant IAM Standards and Protocols for Cloud Services – IAM Practices in the Cloud – Cloud Authorization Management. Security Management in the Cloud: Security Management Standards – Security Management in the Cloud – Availability Management: SaaS, PaaS, IaaS.

UNIT – IV PRIVACY ISSUES [9]

Privacy Issues – Data Life Cycle – Key Privacy Concerns in the Cloud – Protecting Privacy – Changes to Privacy Risk Management and Compliance in Relation to Cloud Computing – Legal and Regulatory Implications – U.S. Laws and Regulations – International Laws and Regulations.

UNIT – V AUDIT AND COMPLIANCE [9]

Internal Policy Compliance – Governance – Risk and Compliance (GRC) – Regulatory/External Compliance – Cloud Security Alliance – Auditing the Cloud for Compliance – Security-as-a-Cloud.

Total = 45 Periods

Reference Books :

1 John Rhoton, Cloud Computing Explained: Implementation Handbook for Enterprises, Saint Louis, New York, First Edition, 2009.

2 Tim Mather, Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance (Theory in Practice), O'Reilly Media, California, Second Edition, 2009.

3 Rajkumar Buyya, Christian Vecchiola, and ThamaraiSelvi, Mastering Cloud Computing, Tata McGraw Hill, New Delhi, Third Edition, 2013

4 Tom White, Hadoop: The Definitive Guide, Yahoo Press, , New York, Third Edition, 2012

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SEMESTER – I(ELECTIVE)

CS20168	**MULTI CORE ARCHITECTURES**	L	T	P	C
		3	0	0	3

Course Outcomes: On Completion of this course, the student will be able to		***Cognitive Level***
CO1:	*Identify the limitations of ILP and the need for multicore architectures.*	*Understand*
CO2:	*Discuss the issues related to multiprocessing and suggest solutions.*	*Understand*
CO3:	*Point out the salient features of different multicore architectures and how they exploit parallelism.*	*Understand*
CO4:	*Critically analyze the different types of inter connection networks.*	*Understand*
CO5:	*Design a memory hierarchy and optimize it.*	*Create*

UNIT – I FUNDAMENTALS OF COMPUTER DESIGN AND ILP [9]

Fundamentals of Computer Design – Measuring and Reporting Performance – Instruction Level Parallelism and its Exploitation – Concepts and Challenges – Limitations of ILP – Multithreading – SMT and CMP Architectures – The Multicore era.

UNIT – II MEMORY HIERARCHY DESIGN [9]

Introduction – Optimizations of Cache Performance – Memory Technology and Optimizations – Protection: Virtual Memory and Virtual Machines – Design of Memory Hierarchies – Case Studies.

UNIT – III MULTIPROCESSOR ISSUES [9]

Symmetric and Distributed Shared Memory Architectures – Cache Coherence Issues – Performance Issues – Synchronization Issues – Models of Memory Consistency – Interconnection Networks – Buses, Crossbar and Multi-Stage Interconnection Networks.

UNIT – IV MULTICORE ARCHITECTURES [9]

Homogeneous and Heterogeneous Multi–core Architectures – Intel Multicore Architectures – SUN CMP Architecture – IBM Cell Architecture -- Introduction to Warehouse -- Scale Computers, Cloud Computing – Architectures and Issues – Case Studies.

UNIT – V VECTOR AND GPU ARCHITECTURES [9]

Vector Architecture – SIMD Extensions for Multimedia – Graphics Processing Units – Case Studies – GPGPU Computing – Detecting and Enhancing Loop Level Parallelism.

Total = 45 Periods

Reference Books :

1 John L. Hennessey and David A. Patterson, Computer Architecture – A Quantitative Approach, Morgan Kaufmann / Elsevier, Netherlands, Fifth edition, 2012.
2 Darryl Gove, Multicore Application Programming: For Windows, Linux, and Oracle Solaris, Pearson, New Delhi, Second Edition, 2011.
3 David B. Kirk, Wen-mei W. Hwu, Programming Massively Parallel Processors, Elsevier Inc, USA, First Edition, 2010.
4 Wen–mei W. Hwu, GPU Computing Gems, Morgan Kaufmann / Elsevier, London, Second Edition, 2011.

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SEMESTER – I(ELECTIVE)

CS20169	**ADVANCED DATABASE TECHNOLOGY**	L	T	P	C
		3	0	0	3

Course Outcomes: On Completion of this course, the student will be able to		***Cognitive Level***
CO1:	*Design relational databases.*	*Apply*
CO2:	*Implement parallel and distributed databases.*	*Create*
CO3:	*Analyze the concept of XML databases and multimedia databases.*	*Analyze*
CO4:	*Demonstrate the concept of database connectivity with the applications.*	*Understand*
CO5:	*Summarize the concepts of current issues.*	*Understand*

UNIT– I RELATIONAL MODEL [9]

Data Model – Types of Data Models: Entity Relationship Model – Relational Data Model – Mapping Entity Relationship Model to Relational Model – Structured Query Language – Database Normalization – Transaction Management.

UNIT– II PARALLEL AND DISTRIBUTED DATABASES [9]

Centralized and Client-Server Architectures – Parallel Systems – Distributed Systems – Parallel Databases – I/O Parallelism – Inter and Intra Query Parallelism – Inter and Intra Operation Parallelism – Distributed Database Concepts: Distributed Data Storage – Distributed Transactions – Commit Protocols – Concurrency Control – Distributed Query Processing.

UNIT– III XML DATABASES [9]

XML Databases: XML Data Model – DTD – XML Schema – XML Querying – Web Databases – Open Database Connectivity.

UNIT– IV MULTIMEDIA DATABASES [9]

Multidimensional Data Structures – Image Databases – Text / Document Databases – Video Databases – Audio Databases – Multimedia Database Design.

UNIT– V CURRENT ISSUES [9]

Active Databases – Deductive Databases – Data Warehousing – Data Mining – Database Tuning – Database Security.

Total = 45 Periods

Reference Books :

1 R. Elmasri and S.B. Navathe, Fundamentals of Database Systems, Addison-Wesley, US, Second Edition, 2011.

2 Thomas Cannolly and Carolyn Begg, Database Systems, A Practical Approach to Design, Implementation and Management, Pearson Education, New Delhi, Third Edition,2007.

3 Henry F Korth, Abraham Silberschatz and S. Sudharshan, Database System Concepts, McGraw Hill, New Delhi, Fifth Edition, 2006.

4 C.J.Date, A.Kannan and S.Swamynathan, An Introduction to Database Systems, Pearson Education, New Delhi, Eight Edition, 2006.

5 V.S.Subramanian, Principles of Multimedia Database Systems, Harcourt India Pvt. Ltd., India, Third Edition, 2001.

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SEMESTER – I(ELECTIVE)

CS20171	**ADVANCED WIRELESS AND MOBILE NETWORKS**	L	T	P	C
		3	0	0	3

Course Outcomes: On Completion of this course, the student will be able to		***Cognitive Level***
CO1:	*Demonstrate advanced knowledge of networking and wireless networking.*	*Understand*
CO2:	*Design WLAN, WPAN, WWAN and cellular based upon underlying propagation and performance analysis.*	*Create*
CO3:	*Analyze protocols used in wireless networks and learn simulating wireless networks.*	*Analyze*
CO4:	*Construct wireless networks exploring trade-offs between wire line and wireless links.*	*Apply*
CO5:	*Develop mobile applications to solve some of the real world problems.*	*Apply*

UNIT – I BASICS OF WIRELESS NETWORKS [9]

Wireless Networking Trends – Key Wireless Physical Layer Concepts – Multiple Access Technologies – CDMA – FDMA – TDMA – Spread Spectrum technologies – Frequency reuse – Radio Propagation and Modelling – Challenges in Mobile Computing: Resource poorness – Bandwidth – Energy. Wireless Local Area Networks: IEEE 802.11 Wireless LANs Physical & MAC layer – 802.11 MAC Modes (DCF& PCF) IEEE 802.11 standards – Architecture and protocols – Infrastructure Vs Adhoc Modes – Hidden Node and Exposed Terminal Problem – Fading Effects in Indoor and outdoor WLANs – WLAN Deployment issues.

UNIT – II WIRELESS CELLULAR NETWORKS [9]

Wireless Cellular Networks: 1G and 2G – 2.5G – 3G and 4G – Mobile IPv4 – Mobile IPv6 – TCP over Wireless Networks – Cellular architecture – Frequency reuse – Channel assignment strategies – Handoff strategies – Interference and system capacity – Improving coverage and capacity in cellular systems – Spread spectrum Technologies.

UNIT – III WIRELESS SENSOR NETWORKS [9]

WiMAX (Physical layer, Media access control, Mobility and Networking) – IEEE 802.22Wireless Regional Area Networks – IEEE 802.21 Media Independent Handover Overview. Wireless Sensor Networks: Introduction – Application – Physical – MAC layer and Network Layer – Power Management – Tiny OS Overview.

UNIT – IV WIRELESS PANs AND SECURITY [9]

Wireless PANs: Bluetooth and Zigbee – Introduction to Wireless Sensors. Security: Security in wireless Networks Vulnerabilities – Security techniques – Wi-Fi Security – DoS in wireless communication.

UNIT – V ADVANCED TOPICS [9]

IEEE 802.11x and IEEE 802.11i standards – Introduction to Vehicular Adhoc Networks.

Total = 45 Periods

Reference Books :

1 Schiller J.,Mobile Communications, Addison Wesley, USA, Second Edition, 2008.

2 Stallings W., Wireless Communications and Networks, Pearson Education, India, First Edition, 2009.

3 Stojmenic Ivan, Handbook of Wireless Networks and Mobile Computing, John Wiley and Sons Inc, Mexico, Second Edition, 2002.

4 Yi Bing Lin and Imrich Chlamtac, Wireless and Mobile Network Architectures, John Wiley and Sons Inc, Mexico, Second Edition, 2000.

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SEMESTER – II(ELECTIVE)

CS20261	**DATA PREPARATION AND ANALYSIS**	L	T	P	C
		3	0	0	3

Course Outcomes: On Completion of this course, the student will be able to		***Cognitive Level***
CO1:	*Outline the basics of data gathering and preparation.*	*Understand*
CO2:	*Examine how the data cleaning is used in the data processing.*	*Apply*
CO3:	*Extract the data for performing the Analysis.*	*Apply*
CO4:	*Designing visualization and Hierarchies and networks.*	*Create*
CO5:	*Summarize the different statistics techniques for problem solving.*	*Understand*

UNIT – I DATA GATHERING AND PREPARATION [9]

Data formats – parsing and transformation – Scalability and real-time issues.

UNIT – II DATA CLEANING [9]

Consistency checking – Heterogeneous and missing data – Data Transformation and segmentation.

UNIT – III EXPLORATORY ANALYSIS [9]

Descriptive and comparative statistics – Clustering and association – Hypothesis generation.

UNIT –IV VISUALIZATION [9]

Designing visualizations – Time series – Geo located data – Correlations and connections – Hierarchies and networks – interactivity

UNIT– V STATISTICS [9]

Descriptive statistics – Inferential statistics – Comparative statistics

Total = 45 Periods

Reference Books :

1 Glenn J. Myatt, Making sense of Data: A practical Guide to Exploratory Data Analysis and Data Mining, John Wiley & Sons Inc, US, Second Edition, 2014.

2 Donald J. Wheeler, Making Sense of Data, SPC Press, US, Third Edition, 2003.

3 Dorian Pyle, Data Preparation for Data Mining, Morgan Kaufmann, Mexico, First Edition, 1999

4 Gerhard Svalbard, Data Preparation for Analytics Using SAS, SAS Institute, India, Second Edition, 2006.

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SEMESTER – II (ELECTIVE)

CS20262	**SECURE SOFTWARE DESIGN AND ENTERPRISE COMPUTING**	L	T	P	C
		3	0	0	3

Course Outcomes: On Completion of this course, the student will be able to		***Cognitive Level***
CO1:	*Differentiate between various software vulnerabilities.*	*Understand*
CO2:	*Software process vulnerabilities for an organization.*	*Understand*
CO3:	*Monitor resources consumption in a software.*	*Evaluate*
CO4:	*Interrelate security and software development process.*	*Understand*
CO5:	*Summarize the case study of various attacks.*	*Understand*

UNIT – I SECURE SOFTWARE DESIGN [9]

Software vulnerabilities and Software security analysis – Master security programming practices – Master fundamental software security design concepts – Security testing and quality assurance.

UNIT –II ENTERPRISE APPLICATION DEVELOPMENT [9]

Nature and scope of enterprise software applications – Design distributed N-tier software application – Research technologies available for the presentation – Business and data tiers of an enterprise software application – Design and build a database using an enterprise database system – Develop components at the different tiers in an enterprise system – Design and develop a multi-tier solution to a problem using technologies used in enterprise system – Present software solution.

UNIT – III ENTERPRISE SYSTEMS ADMINISTRATION [9]

Design – Implement and maintain a directory-based server infrastructure in a heterogeneous systems environment – Monitor server resource utilization for system reliability and availability – Install and administer network services (DNS/DHCP/Terminal Services/Clustering/Web/Email).

UNIT – IV ENTERPRISE NETWORK [9]

Obtain the ability to manage and troubleshoot a network running multiple services – Understand the requirements of an enterprise network – Handle insecure exceptions and command/SQL injection – Defend web and mobile applications against attackers – Software containing minimum vulnerabilities and flaws.

UNIT– V CASE STUDY [9]

Case study of DNS server – DHCP configuration and SQL injection attack.

Total = 45 Periods

Reference Books :

1 Theodor Richardson, Charles N Thies, Secure Software Design, Jones & Bartlett, US, First Edition, 2012.

2 Kenneth R. van Wyk, Mark G. Graff, Dan S. Peters, Diana L. Burley, Enterprise Software Security, Addison-Wesley Professional, New York, Third Edition, 2014

3 Raimundas Matulevicius, Fundamentals of Secure System Modelling, Springer, US, Second Edition, 2017.

4 Loren Kohnfelder, Designing Secure Software: A Guide for Developers, No Starch Press, San Francisco, First Edition, 2021.

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SEMESTER – II (ELECTIVE)

CS20263	**COMPUTER VISION**	L	T	P	C
		3	0	0	3

Course Outcomes: On Completion of this course, the student will be able to		***Cognitive Level***
CO1:	*Developed the practical skills necessary to build computer vision applications.*	*Create*
CO2:	*Gained exposure to object and scene recognition and categorization from images.*	*Understand*
CO3:	*Analysis the detection and performance of computer vision.*	*Analyze*
CO4:	*Know the concept of feature extraction and preprocessing.*	*Understand*
CO5:	*Outline the various pattern analysis and classification techniques.*	*Understand*

UNIT – I OVERVIEW OF COMPUTER VISION [9]

Overview – Computer imaging systems – Lenses – Image formation and sensing – Image analysis – pre-processing and Binary image analysis.

UNIT – II DETECTION AND PERFORMANCE [9]

Edge detection – Edge detection performance – Hough transform – Corner detection.

UNIT – III SEGMENTATION [9]

Segmentation – Morphological filtering – Fourier transforms.

UNIT – IV FEATURE EXTRACTION AND PREPROCESSING [9]

Feature extraction – Shape – Histogram – Color – Spectral – Texture – CVIP tools – Feature analysis – Feature vectors – Distance /similarity measures – Data preprocessing.

UNIT – V PATTERN ANALYSIS AND CLASSIFICATION [9]

Pattern Analysis: Clustering: K-Means – K-Medoids and Mixture of Gaussians. Classification: Discriminant Function – Supervised – Un-supervised – Semi supervised Classifiers: Bayes – KNN – ANN model – Dimensionality Reduction: PCA – LDA – ICA and Non-parametric methods.

Total = 45 Periods

Reference Books :

1 Richard Szeliski, Computer Vision: Algorithms and Applications, Springer, London, Third Edition, 2010.

2 Goodfellow, Bengio, and Courville, Deep Learning, MIT Press, Cambridge, England, Second Edition, 2016.

3 Fisher et al., Dictionary of Computer Vision and Image Processing, John Wiley & Sons, US, Second Edition, 2013.

4 Simon J. D. Prince, Computer Vision: Models, Learning, and Inference, Cambridge University Press, New York, First Edition, 2012.

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SEMESTER – II(ELECTIVE)

CS20264	**HUMAN AND COMPUTER INTERACTION**	L	T	P	C
		3	0	0	3

Course Outcomes: On Completion of this course, the student will be able to		***Cognitive Level***
CO1:	*Summarize the structure of models, human computer interaction and vision.*	*Analyze*
CO2:	*Know the interactive design basics and rules.*	*Evaluate*
CO3:	*Outline the communication and collaboration models.*	*Understand*
CO4:	*Analysis the platforms and application frameworks for mobile eco systems.*	*Analyze*
CO5:	*Design an interactive web interface on the basis of models studied.*	*Create*

UNIT – I BASICS OF HUMAN AND COMPUTER [9]

Human: I/O channels – Memory – Reasoning and problem solving; computer: Devices – Memory – Processing and networks. Interaction: Models– Frameworks – Ergonomics – Styles – Elements – Interactivity-Paradigms

UNIT – II INTERACTIVE DESIGN BASICS AND RULES [9]

Interactive Design basics – Process – Scenarios – Navigation – Screen design – Iteration and prototyping. HCI in software process – Software life cycle – Usability Engineering – Prototyping in practice – Design rationale. Design rules– Principles, Standards, Guidelines and Rules. Evaluation Techniques – Universal Design

UNIT –III COGNITIVE MODELS [9]

Cognitive models – Socio-Organizational issues and stake holder requirements – Communication and collaboration models–Hypertext – Multimedia and WWW.

UNIT – IV MOBILE ECOSYSTEM AND APPLICATIONS [9]

Mobile Ecosystem: Platforms – Application frameworks – Types of Mobile Applications: Widgets – Applications – Games- Mobile Information Architecture – Mobile 2.0. Mobile Design: Elements of Mobile Design – Tools.

UNIT –V WEB INTERFACES [9]

Designing Web Interfaces – Drag and Drop – Direct Selection – Contextual Tools – Overlays – Inlays and Virtual Pages – Process Flow.

Total = 45 Periods

Reference Books :

1 Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, Human Computer Interaction, Pearson Education, New Delhi, Third Edition, 2004.

2 Brian Fling, Mobile Design and Development, O'Reilly Media Inc., Sebastopol / California, First Edition, 2009.

3 Bill Scott and Theresa Neil, Designing Web Interfaces, O'Reilly, Sebastopol / California, First Edition, 2009.

4 Gerard Jounghyun Kim, Human-Computer Interaction: Fundamentals and Practice, CRC Press, New York, First Edition, 2015.

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SEMESTER – II(ELECTIVE)

CS20265	**DIGITAL FORENSICS**	L	T	P	C
		3	0	0	3

Course Outcomes: On Completion of this course, the student will be able to		***Cognitive Level***
CO1:	*Identify relevant legislation and codes of ethics.*	*Understand*
CO2:	*Evaluate the Computer forensics and digital detective and various processes, policies and procedures.*	*Evaluate*
CO3:	*E-discovery, guidelines and standards, E-evidence, tools and environment.*	*Understand*
CO4:	*Email and web forensics and network forensics Identify applications suitable for different types of machine learning with suitable justification.*	*Create*
CO5:	*Analyze the concepts of mobile forensics.*	*Analyze*

UNIT – I BASICS OF DIGITAL FORENSICS [9]

Digital Forensics Science: Forensics science – Computer forensics and digital forensics. Computer Crime: Criminalistics as it relates to the investigative process – Analysis of cyber-criminalistics area – Holistic approach to cyber-forensics.

UNIT – II CYBER CRIME SCENE ANALYSIS [9]

Cyber Crime Scene Analysis: Court orders and methods to search and seizure electronic evidence – Retrieved and un-retrieved communications – Discuss the importance of understanding what court documents would be required for a criminal investigation.

UNIT – III EVIDENCE MANAGEMENT AND PRESENTATION [9]

Evidence Management and Presentation: Create and manage shared folders using operating system – Importance of the forensic mindset – Define the workload of law enforcement – Explain what the normal case would look like – Define who should be notified of a crime – Parts of gathering evidence – Define and apply probable cause.

UNIT – IV COMPUTER AND NETWORK FORENSICS [9]

Computer Forensics: Prepare a case – Begin an investigation – Understand computer forensics workstations and software – Conduct an investigation – Complete a case – Critique a case – Network Forensics: Open-source security tools for network forensic analysis – Requirements for preservation of network data.

UNIT – V MOBILE FORENSICS [9]

Mobile Forensics: Mobile forensics techniques – Mobile forensics tools. Legal Aspects of Digital Forensics: IT Act 2000 – Amendment of IT Act 2008.

Total = 45 Periods

Reference Books :

1 John Sammons, The Basics of Digital Forensics, Elsevier, Tokyo, Third Edition, 2014.
2 John Vacca, Computer Forensics: Computer Crime Scene Investigation, Laxmi Publications, Bengaluru Karnataka Third Edition, 2010.
3 Eoghan Casey, Handbook of Digital Forensics and Investigation, Academic Press, India, Second Edition, 2009.
4 Eoghan Casey, Digital Evidence and Computer Crime: Forensic Science, Computers, and the Internet, Academic Press, India, Fourth Edition, 2011.

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SEMESTER – II (ELECTIVE)

CS20266	**ADVANCED OPERATING SYSTEMS**	L	T	P	C
		3	0	0	3

Course Outcomes: On Completion of this course, the student will be able to		***Cognitive Level***
CO1:	*Analyze the basics of operating systems.*	*Analyze*
CO2:	*Demonstrate the various protocols of distributed operating systems.*	*Evaluate*
CO3:	*Identify the different features of mobile and real-time operating systems.*	*Understand*
CO4:	*Discuss the various features of mainframe operating systems.*	*Understand*
CO5:	*Summarize the concepts of Linux operating systems.*	*Remember*

UNIT – I BASICS OF OPERATING SYSTEMS [9]

Overview – Synchronization Mechanisms – Processes and Threads – Process Deadlocks – Issues in Distributed Operating Systems – Communication Primitives – Limitations of a Distributed System.

UNIT – II DISTRIBUTED OPERATING SYSTEMS [9]

Lamport's Logical Clocks – Vector Clocks – Causal Ordering of Messages – Distributed Mutual Exclusion Algorithms – Centralized, Distributed and Hierarchical Deadlock Detection Algorithms – Agreement Protocols.

UNIT –III DISTRIBUTED RESOURCE MANAGEMENT [9]

Distributed File Systems – Design Issues – Google File System – Hadoop Distributed File System – Distributed Shared Memory – Algorithms for Implementing Distributed Shared Memory – Load Distributed Algorithms – Issues in Task Migration – Synchronous and Asynchronous Check Pointing and Recovery – Fault Tolerance – Two-Phase Commit Protocol – Non-Blocking Commit Protocol.

UNIT – IV MOBILE AND REAL TIME OPERATING SYSTEMS [9]

Basic Model of Real Time Systems – Characteristics – Applications of Real Time Systems – Real Time Task Scheduling – Handling Resource Sharing – Mobile Operating Systems – Architecture – Layers – Microkernel Design – Kernel Extensions – Processes and Threads – Memory Management – File system – Android – iOS.

UNIT – V MAINFRAME AND LINUX OPERATING SYSTEMS [9]

Mainframe – z/OS – Overview of z/OS Facilities – Virtual Storage and Other Mainframe Concepts – Workload Management – I/O and Data Management – Supervising the Execution of Work in the System – Cross-Memory Services – Characteristics of z/OS. Linux – Design Principles – Kernel Modules – Process Management – Scheduling – Memory Management – I/O Management – File System – Inter Process Communication.

Total = 45 Periods

Reference Books :

1 Nikolay Elenkov, Android Security Internals: An In-Depth Guide to Android's Security Architecture, No Starch Press, India, Second Edition, 2014.

2 Andrew S. Tanenbaum and Herbert Bos, Modern Operating Systems, Prentice Hall, US, Fourth Edition, 2014

3 Jonathan Levin, Mac OS X and iOS Internals: To the Apple's Core, John Wiley & Sons, California, Fifth Edition, 2012.

4 Neil Smyth, iPhone iOS 4 Development Essentials – Xcode, Payload Media, India, Fourth Edition, 2011.

5 MukeshSinghal, NiranjanShivaratri, Advanced Concepts in Operating Systems – Distributed, Database and Multiprocessor Operating Systems, Tata McGraw-Hill, New Delhi, First Edition, 2001.

6 Rajib Mall, Real-Time Systems: Theory and Practice, Prentice Hall, US, Second Edition, 2006.

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SEMESTER – II(ELECTIVE)

CS20267	**FAULT TOLERANT SYSTEMS**	L	T	P	C
		3	0	0	3

Course Outcomes: On Completion of this course, the student will be able to		***Cognitive Level***
CO1:	*Define the traditional measures of fault tolerance.*	*Understand*
CO2:	*Point out the processor level fault tolerance techniques.*	*Understand*
CO3:	*Critically analyze the different types of RAID levels.*	*Apply*
CO4:	*Discuss techniques like recovery blocks and N-version programming.*	*Evaluate*
CO5:	*Identify techniques for check pointing in distributed and shared memory systems.*	*Analyze*

UNIT – I BASICS OF FAULT TOLERANCE [9]

Fault Classification – Types of Redundancy – Basic Measures of Fault Tolerance – Hardware Fault Tolerance – The Rate of Hardware Failures – Failure Rate – Reliability and Mean Time to Failure – Canonical and Resilient Structures – Other Reliability Evaluation Techniques – Processor Level Techniques

UNIT – II INFORMATION REDUNDANCY [9]

Information Redundancy – Coding – Resilient Disk Systems – Data Replication – Voting: Hierarchical Organization – Primary-Backup Approach – Algorithm-Based Fault Tolerance, Fault Tolerant Networks: Measures of Resilience – Common Network Topologies and Their Resilience – Fault Tolerant Routing

UNIT – III SOFTWARE FAULT TOLERANCE [9]

Acceptance Tests – Single Version Fault Tolerance – N Version Programming – Recovery Block Approach – Preconditions – Post Conditions and Assertions – Exception Handling, Software Reliability Models – Fault Tolerant Remote Procedure Calls.

UNIT – IV CHECK POINTING [9]

Introduction – Checkpoint Level – Optimal Check Pointing – An Analytical Model – Cache-Aided Rollback Error Recovery – Check Pointing in Distributed Systems – Check Pointing in Shared – Memory Systems – Check Pointing in Real – Time Systems – Case Studies: Non Stop Systems – Stratus Systems – Cassini Command and Data Subsystem.

UNIT – V FAULT DETECTION IN CRYPTOGRAPHIC SYSTEMS [9]

Security Attacks Through Fault Injection – Fault Attacks on Symmetric Key Ciphers – Fault Attacks on Asymmetric Key Ciphers – Counter Measures – Spatial and Temporal Duplication – Error Detecting Codes

Total = 45 Periods

Reference Books :

1 Israel Koren and Mani Krishna, Fault Tolerant Systems, Morgan Kaufmann, Mexico, Fourth Edition, 2010
2 Martin L Shooman, Reliability of Computer Systems and Networks: Fault Tolerance, Analysis and Design, Willey Inc, US, First Edition, 2002.
3 LL Pullam, Software Fault Tolerance Techniques and Implementation, Art tech House Computer Security Series, Springer, New York, Second Edition, 2002.
4 Parag K. Lala, Fault Tolerant and Fault Testable Hardware Design, Prentice-Hall International, US, First Edition, 1984.

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SEMESTER – II(ELECTIVE)

CS20268	**BIG DATA AND ANALYTICS**	L	T	P	C
		3	0	0	3

Course Outcomes: On Completion of this course, the student will be able to		***Cognitive Level***
CO1:	*Use Hadoop and MapReduce framework.*	*Create*
CO2:	*Suggest areas to apply big data to increase business outcome.*	*Analyze*
CO3:	*Contextually integrate and correlate large amounts of information automatically to gain faster insights.*	*Understand*
CO4:	*Outline the concepts of various clustering techniques.*	*Understand*
CO5:	*Discuss the application of big data.*	*Understand*

UNIT – I BASICS OF BIG DATA [9]

Analytics – Nuances of Big Data – Value – Issues – Case for Big Data – Big Data options Team challenge – Big Data sources – Acquisition – Nuts and Bolts of Big data–Features of Big Data – Security, Compliance, Auditing and Protection – Evolution of Big Data – Best Practices for Big data Analytics – Big Data characteristics.

UNIT – II LAMBDA CALCULUS AND DATA ANALYSIS [9]

Lambda Notation for Functions – Syntax – Curried Functions – Parametric Polymorphism – Lambda Reduction – Alpha Reduction – Beta Reduction – Beta Abstraction – Extensionality Theorem – Delta Reduction – Reduction strategies – Normal forms – Church-Rosser Theorems – Pure Lambda Calculus – Constants – Arithmetic – Evolution of Analytic Scalability – Convergence – Parallel Processing systems – Map reduce – Enterprise analytic Sand baox – Analytic Data Sets – Analytic methods – Analytic tools – Cognos – Microstrategy – Pentaho.

UNIT –III STREAM COMPUTING [9]

Introduction to Streams Concepts – Stream Data Model and Architecture – Stream Computing, Sampling Data in a stream – Filtering Streams – Counting Distinct Elements in a stream – Estimating Moments – Counting Oneness in a Window – Decaying Window – Real Time Analytics Platform(RTAP) Applications IBM Infosphere – Big Data at rest – Infosphere Streams – Data Stage – Statistical Analysis – Intelligent Scheduler – Infosphere Streams

UNIT – IV PREDICTIVE ANALYTICS AND VISUALIZATION [9]

Predictive Analytics – Supervised – Unsupervised Learning – Neural Networks – Kohonen Models – Normal – Deviations from Normal Patterns – Normal Behaviours – Expert Options – Variable Entry – Mining Frequent Itemsets – Market Based Model – 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 Visualizations – Visual Data Analysis Techniques – Interaction techniques – Systems and Applications

UNIT – V FRAMEWORKS AND APPLICATIONS [9]

IBM for Big Data – Map Reduce Framework – Hadoop – Hive – Sharding – NoSQL Databases – S3 – Hadoop Distributed File Systems – Hbase – Impala – Analyzing Big Data with twitter – Big Data for Ecommerce – Big Data for Blogs

Total = 45 Periods

Reference Books :

1 Michael Minelli, Michelle Chambers, and AmbigaDhiraj, Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses, Wiley, California, Third Edition, 2013.
2 P. J. Sadalage and M. Fowler, NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Addison-Wesley Professional, Boston, Fourth Edition, 2012.
3 Tom White, Hadoop: The Definitive Guide, O'Reilley, US, Third Edition, 2012.
4 Eric Sammer, Hadoop Operations, O'Reilley, US, Third Edition, 2012.
5 Alan Gates, Programming Pig, O'Reilley, US, Second Edition, 2011.

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SEMESTER – II(ELECTIVE)

CS20269	**COGNITIVE SCIENCE**	L	T	P	C
		3	0	0	3

Course Outcomes: On Completion of this course, the student will be able to		***Cognitive Level***
CO1:	*Explain and analyze the major concepts, philosophical and theoretical perspectives, empirical findings, and historical trends in cognitive science, related to cultural diversity and living in a global community.*	*Understand*
CO2:	*Use cognitive science knowledge base to create their own methods for answering novel questions of either a theoretical or applied nature.*	*Understand*
CO3:	*Critically evaluate the work of others in the same domain.*	*Analyze*
CO4:	*Proficient with basic cognitive science research methods, including both theory-driven.*	*Evaluate*
CO5:	*Applied research design, data collection, analysis and interpretation.*	*Analyze*

UNIT – I BASICS OF COGNITIVE SCIENCE [9]

Cognitive view – Some Fundamental Concepts – Computers in Cognitive Science – Applied Cognitive Science – Interdisciplinary Nature of Cognitive Science – Artificial Intelligence: Knowledge Representation – Nature of Artificial Intelligence – Knowledge Representation – Artificial Intelligence: Search, Control and Learning.

UNIT – II COGNITIVE PSYCHOLOGY [9]

Cognitive Psychology – Architecture of the Mind – Nature of Cognitive Psychology – A Global View of The Cognitive Architecture – Propositional Representation – Schematic Representation – Cognitive Processes, Working Memory and Attention – Acquisition of Skill – Connectionist Approach to Cognitive Architecture.

UNIT – III COGNITIVE NEUROSCIENCE [9]

Brain and Cognition Introduction to the Study of the Nervous System – Neural Representation – Neuropsychology – Computational Neuroscience – Organization of the Mind – Organization of Cognitive Systems – Strategies for Brain Mapping.

UNIT – IV LANGUAGE ACQUISITION, SEMANTICS AND PROCESSING MODELS [9]

Milestones in Acquisition – Theoretical Perspectives – Semantics and Cognitive Science – Meaning and Entailment – Reference – Sense – Cognitive and Computational Models of Semantic Processing – Information Processing Models of the MIND – Physical Symbol Systems and Language of Thought – Applying the Symbolic Paradigm – Neural Networks and Distributed Information Processing – Neural Network Models of Cognitive Processes.

UNIT – V HIGHER LEVEL COGNITION [9]

Reasoning – Decision Making – Computer Science and AI: Foundations and Robotics – New Horizons – Dynamical Systems and Situated Cognition – Challenges – Emotions and Consciousness – Physical and Social Environments – Applications.

Total = 45 Periods

Reference Books :

1 José Luis Bermúdez, Cognitive Science: An Introduction to the Science of the Mind, Cambridge University Press, New York, Fourth Edition, 2014
2 Carolyn Panzer Sobel and Paul Li, Cognitive Science: An Interdisciplinary Approach, Mayfield Publishing Company, US, Second Edition, 2013
3 Neil Stillings, Steven E. Weisler, Christopher H. Chase and Mark H. Feinstein, Cognitive Science: An Introduction, MIT press, Cambridge, Second Edition, 1995.
4 Robert L. Solso, Otto H. MacLin and M. Kimberly Mac Lin, Cognitive Psychology, India, Pearson Education, First Edition, 2007.
5 Paul Thagard, Mind Introduction to Cognitive Science , MIT Press, Cambridge, Second Edition, 2005.

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SEMESTER – II(ELECTIVE)

CS20271	**INFORMATION RETRIEVAL TECHNIQUES**	L	T	P	C
		3	0	0	3

Course Outcomes: On Completion of this course, the student will be able to		***Cognitive Level***
CO1:	*Build an information retrieval system using the available tools.*	*Evaluate and Create*
CO2:	*Identify and design the various components of an information retrieval system.*	*Understand*
CO3:	*Outline the concepts of index construction and index compression.*	*Understand*
CO4:	*Apply machine learning techniques to text classification and clustering which is used for efficient Information Retrieval.*	*Analyze*
CO5;	*Design an efficient search engine and analyze the web content structure.*	*Apply*

UNIT – I MOTIVATION [9]

Basic Concepts – Practical Issues - Retrieval Process – Architecture – Boolean Retrieval – Retrieval Evaluation – Open-Source IR Systems – History of Web Search – Web Characteristics –The impact of the web on IR – IR Versus Web Search – Components of a Search Engine

UNIT – II MODELING [9]

Taxonomy and Characterization of IR Models – Boolean Model – Vector Model – Term Weighting – Scoring and Ranking – Language Models – Set Theoretic Models –Probabilistic Models – Algebraic Models – Structured Text Retrieval Models – Models for Browsing

UNIT – III INDEXING [9]

Static and Dynamic Inverted Indices – Index Construction and Index Compression. Searching – Sequential Searching and Pattern Matching. Query Operations – Query Languages – Query Processing – Relevance Feedback and Query Expansion – Automatic Local and Global Analysis – Measuring Effectiveness and Efficiency

UNIT – IV CLASSIFICATION AND CLUSTERING [9]

Text Classification and Naive Bayes – Vector Space Classification – Support Vector Machines and Machine Learning on Documents. Flat Clustering – Hierarchical Clustering – Matrix Decompositions and Latent Semantic Indexing – Fusion and Meta Learning

UNIT – V SEARCHING THE WEB [9]

Searching the Web – Structure of the Web – IR and web search – Static and Dynamic Ranking – Web Crawling and Indexing – Link Analysis – XML Retrieval Multimedia IR: Models and Languages – Indexing and Searching Parallel and Distributed IR – Digital Libraries

Total = 45 Periods

Reference Books :

1 Ricardo Baeza, Yates, Berthier Ribeiro and Neto, Modern Information Retrieval: The concepts and Technology behind Search, ACM Press Books, New York, Second Edition, 2011.
2 Stefan Buttcher, Charles L. A. Clarke and Gordon V. Cormack, Information Retrieval Implementing and Evaluating Search Engines, The MIT Press, Cambridge, Massachusetts London, England, Third Edition, 2010.
3 Christopher D. Manning, Prabhakar Raghavan and Hinrich Schutze, Introduction to Information Retrieval, Cambridge University Press, US, First Edition, 2008.
4 Gerald J. Kowalski, Mark T. Maybury, Information Storage and Retrieval Systems: Theory and Implementation, Springer, US, Sixth Edition, 2013.

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SEMESTER – III(ELECTIVE)

		L	T	P	C
CS20361	**MOBILE APPLICATIONS AND SERVICES**	3	0	0	3

Course Outcomes: On Completion of this course, the student will be able to		***Cognitive Level***
CO1:	*Identify the target platform and users.*	*Evaluate*
CO2:	*Define and sketch a mobile application*	*Apply*
CO3:	*Summarize the fundamentals, frameworks, and development lifecycle of mobile application platforms.*	*Analyze*
CO4:	*Design and develop a mobile application prototype in one of the platforms and deploying.*	*Apply*
CO5:	*Be familiar with platforms and additional issues.*	*Evaluate*

UNIT – I BASICS OF MOBILE APPLICATION [9]

Introduction: Mobile Computing and Android Development Environment – Factors in Developing Mobile Applications – Mobile Software Engineering – Frameworks and Tools – Generic UI Development Android User.

UNIT – II USER INTERFACES [9]

VUIs and Mobile Apps – Text-to-Speech Techniques – Designing the Right UI – Multichannel and Multimodal UIs – Storing and Retrieving Data – Synchronization and Replication of Mobile Data – Getting the Model Right – Android Storing and Retrieving Data – Working with a Content Provider.

UNIT – III COMMUNICATIONS VIA NETWORK AND THE WEB [9]

State Machine – Correct Communications Model – Android Networking and Web –Telephony Deciding Scope of an App – Wireless Connectivity and Mobile Apps – Android Telephony Notifications and Alarms: Performance and Memory Management – Android Notifications and Alarms – Graphics – Performance and Multithreading – Graphics and UI Performance – Android Graphics

UNIT – IV DEPLOYING AND MULTIMEDIA [9]

Packaging and Deploying – Performance Best Practices – Android Field Service App – Location Mobility and Location Based Services Android. Multimedia: Mobile Agents and Peer-to-Peer Architecture – Android Multimedia

UNIT – V ISSUES AND RECENT TRENDS [9]

Platforms and Additional Issues: Development Process – Architecture – Design –Technology Selection – Mobile App Development Hurdles – Testing – Security and Hacking – Active Transactions – More on Security – Hacking Android. Recent trends in Communication protocols for IOT nodes – Mobile computing techniques in IOT – Agents based communications in IOT.

Total = 45 Periods

Reference Books :

1 Wei-Meng Lee, Beginning Android 4 Application Development, John Wiley & Sons, Hoboken, New Jersey, Fourth Edition, 2012.
2 Jeff McWherter, Scott Gowell, Professional Mobile Application Development, John Wiley & Sons, New Jersey, Second Edition, 2012.
3 Anup Kumar, Bin Xie, Handbook of Mobile Systems Applications and Services, CRC Press, US, First Edition, 2016.
4 Anubhav Pradhan, Anil V Deshpande, Composing Mobile Apps using Android, Wiley India Pvt Ltd, India, India, Fourth Edition, 2014.

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SEMESTER – III(ELECTIVE)

CS20362	**COMPILER FOR HIGH PERFORMANCE COMPUTING**	L	T	P	C
		3	0	0	3

Course Outcomes: On Completion of this course, the student will be able to		***Cognitive Level***
CO1:	*Be familiar with the structure of compiler.*	*Understand*
CO2:	*Summarize parallel loops, data dependency, exception handling and debugging in compiler.*	*Evaluate*
CO3:	*Outline the concept of loop restructuring and optimizing.*	*Apply*
CO4:	*Evaluate the concurrency and vector analysis.*	*Analyze*
CO5:	*Infer the message passing and scalable shared-memory.*	*Understand*

UNIT – I FUNDAMENTALS OF COMPILER [9]

High Performance Systems – Structure of Compiler – Programming Language Features – Languages for High Performance.

UNIT – II DATA DEPENDENCE [9]

Data Dependence: Data Dependence in Loops – Data Dependence in Conditionals – Data Dependence in Parallel Loops – Program Dependence Graph. Scalar Analysis with Factored Use-Def Chains: Constructing Factored Use-Def Chains – FUD Chains for Arrays – Induction Variables Using FUD Chains – Constant Propagation with FUD Chains – Data Dependence for Scalars – Data Dependence Analysis for Arrays.

UNIT – III LOOP RESTRUCTURING AND OPTIMIZING [9]

Array Region Analysis – Pointer Analysis – I/O Dependence – Procedure Calls – Inter-procedural Analysis – Loop Restructuring: Simple Transformations – Loop Fusion – Loop Fission – Loop Reversal – Loop Interchanging – Loop Skewing – Linear Loop Transformations – Strip-Mining– Loop Tiling – Optimizing for Locality: Single Reference to Each Array –Multiple References – General Tiling – Fission and Fusion for Locality.

UNIT – IV CONCURRENCY AND VECTOR ANALYSIS [9]

Concurrency Analysis: Concurrency from Sequential Loops – Concurrency from Parallel Loops – Nested Loops – Round off Error – Exceptions and Debuggers. Vector Analysis: Vector Code – Vector Code from Sequential Loops – Vector Code from for all Loops – Nested Loops – Round off Error – Exceptions and Multi-vector Computers.

UNIT – V MESSAGE PASSING AND SCALABLE SHARED MEMORY [9]

Message-Passing Machines: SIMD Machines – MIMD Machines – Data Layout – Parallel Code for Array Assignment – Remote Data Access – Automatic Data Layout – Multiple Array Assignments – Scalable Shared-Memory Machines: Global Cache Coherence – Local Cache Coherence – Latency Tolerant Machines.

Total = 45 Periods

Reference Books :

1 Thomas Sterling, Matthew Anderson, Maciej Brodowicz, High Performance Computing: Modern Systems and Practices, Morgan Kaufmann, Mexico, Third Edition, 2017.
2 John Levesque, Gene Wagenbreth, High Performance Computing: Programming and Applications, RC Press, Florida, First Edition, 2010.
3 Michael Wolfe, High-Performance Compilers for Parallel Computing, Addison-Wesley, US, First Edition, 1996.
4 John Levesque, Gene Wagenbreth, High Performance Computing Programming and Applications, CRC Press, New YORK, First Edition, 2010.

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SEMESTER – III(ELECTIVE)

CS20363	**OPTIMIZATION TECHNIQUES**	L	T	P	C
		3	0	0	3

Course Outcomes: On Completion of this course, the student will be able to		***Cognitive Level***
CO1:	*Formulate optimization problems.*	*Understand*
CO2:	*Apply the concept of optimality criteria for various types of optimization problems.*	*Understand*
CO3:	*Solve various constrained and unconstrained problems in Single variable as well as multivariable.*	*Understand*
CO4:	*Analyze the methods of optimization in real life situation.*	*Analyze*
CO5:	*Be familiar with recent trends for optimization techniques.*	*Apply*

UNIT – I FUNDAMENTALS OF OPTIMIZATION [9]

Engineering application of Optimization – Formulation of design problems as mathematical programming problems.

UNIT – II STRUCTURE OF OPTIMIZATION [9]

General Structure of Optimization Algorithms – Constraints – Feasible Region.

UNIT – III MATHEMATICAL PROGRAMMING [9]

Branches of Mathematical Programming: Optimization using calculus – Graphical Optimization – Linear Programming – Quadratic Programming – Integer Programming – Semi Definite Programming.

UNIT – IV OPTIMIZATION ALGORITHMS [9]

Optimization Algorithms like Genetic Optimization – Particle Swarm Optimization – Ant Colony Optimization.

UNIT – V RECENT TRENDS [9]

Recent trends: Applications of ant colony optimization – Applications for Particle Swarm Optimization– Genetics, linear and quadratic programming in real world applications.

Total = 45 Periods

Reference Books :

1 Edwin K., P. Chong & Stanislaw h. Zak, An Introduction to Optimization, John Wiley & Sons, US, Third Edition, 2013.
2 Andreas Antoniou, Wu-Sheng Lu, Practical Optimization Algorithms and Engineering Applications, Springer Science & Business Media, Tokyo, Second Edition, 2007.
3 John K. Karlof, Integer programming: theory and practice, CRC Press, Florida, First Edition, 2006.
4 H. Paul Williams, Logic and Integer Programming, Springer, Mexico, Fourth Edition, 2009.
5 Der-San Chen; Robert G. Batson; Yu Dang, Applied Integer Programming: Modeling and Solution, John Wiley and Sons, US, Third Edition, 2010.

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SEMESTER – III(ELECTIVE)

CS20364	**INTERNET OF THINGS**	L	T	P	C
		3	0	0	3

Course Outcomes: On Completion of this course, the student will be able to		***Cognitive Level***
CO1	*Analyze various protocols for IoT*	*Analyze*
CO2	*Develop web services to access/control IoT devices.*	*Create*
CO3	*Design a portable IoT using Rasperry Pi*	*Understand*
CO4	*Deploy an IoT application and connect to the cloud.*	*Create*
CO5	*Analyze applications of IoT in real time scenario*	*Analyze*

UNIT – I BASICS OF INTERNET OF THINGS [9]

Internet of Things – Physical Design – Logical Design – IoT Enabling Technologies – IoT Levels and Deployment Templates – Domain Specific IoTs – IoT and M2M – IoT System Management with NETCONF– YANG – IoT Platforms Design Methodology

UNIT – II IOT ARCHITECTURE [9]

M2M high-level ETSI architecture –IETF architecture for IoT –- OGC architecture – IoT reference model – Domain model – information model – functional model – communication model – IoT reference architecture

UNIT – III IoT PROTOCOLS [9]

Protocol Standardization for IoT – Efforts – M2M and WSN Protocols – SCADA and RFID Protocols – Unified Data Standards – Protocols – IEEE 802.15.4 – BACNet Protocol – Modbus – Zigbee Architecture – Network layer – 6LowPAN – CoAP – Security

UNIT – IV BUILDING IoT WITH RASPBERRY PI AND ARDUINO [9]

Building IOT with RASPERRY PI – IoT Systems - Logical Design using Python – IoT Physical Devices & Endpoints – IoT Device – Building blocks – Raspberry Pi – Board – Linux on Raspberry Pi – Raspberry Pi Interfaces – Programming Raspberry Pi with Python – Other IoT Platforms – Arduino.

UNIT – V CASE STUDIES AND REAL-WORLD APPLICATIONS [9]

Real world design constraints – Applications – Asset management, Industrial automation, smart grid, Commercial building automation, Smart cities – participatory sensing – Data Analytics for IoT – Software and Management Tools for IoT Cloud Storage Models and Communication APIs – Cloud for IoT – Amazon Web Services for IoT.

Total = 45 Periods

Reference Books :

1 Arshdeep Bahga, Vijay Madisetti, Internet of Things – A hands-on approach, Universities Press, New York, 2015.

2 Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), ―Architecting the Internet of Thingsǁ, Springer, USA, Fourth Edition, 2011.

3 Honbo Zhou, The Internet of Things in the Cloud: A Middleware Perspective, CRC Press, Florida, Second Edition, 2012.

4 Jan Ho ller, Vlasios Tsiatsis, Catherine Mulligan, Stamatis, Karnouskos, Stefan Avesand. David Boyle, From Machine-to-Machine to the Internet of Things - Introduction to a New Age of Intelligence, Elsevier, Mexico, First Edition, 2014.

5 Olivier Hersent, David Boswarthick, Omar Elloumi , The Internet of Things – Key applications and Protocolsǁ, Wiley, US, Second Edition, 2012

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SEMESTER – III(ELECTIVE)

CS20365	**ETHICAL HACKING**	L	T	P	C
		3	0	0	3

Course Outcomes: On Completion of this course, the student will be able to		***Cognitive Level***
CO1:	*Defend hacking attacks and protect data assets.*	*Understand*
CO2:	*Defend a computer against a variety of security attacks using various tools.*	*Understand*
CO3:	*Practice and use safe techniques on the World Wide Web.*	*Remember*
CO4:	*Write the programming for security professionals.*	*Create*
CO5:	*Evaluate the different testing tools.*	*Evaluate*

UNIT – I FUNDAMENTALS OF HACKING [9]

Introduction to Hacking – Importance of Security – Elements of Security – Phases of an Attack – Types of Hacker Attacks – Hacktivism – Vulnerability Research – Introduction to Foot printing – Information Gathering Methodology – Foot printing Tools – WHOIS Tools – DNS Information Tools – Locating the Network Range – Meta Search Engines.

UNIT – II SCANNING AND ENUMERATION [9]

Introduction to Scanning – Objectives – Scanning Methodology – Tools – Introduction to Enumeration – Enumeration Techniques – Enumeration Procedure – Tools.

UNIT – III SYSTEM HACKING [9]

Introduction – Cracking Passwords – Password Cracking Websites – Password Guessing – Password Cracking Tools – Password Cracking Counter measures – Escalating Privileges – Executing Applications – Key loggers and Spyware.

UNIT – IV PROGRAMMING FOR SECURITY PROFESSIONALS [9]

Programming Fundamentals – C language – HTML – Perl – Windows OS Vulnerabilities – Tools for Identifying Vulnerabilities – Countermeasures – Linux OS Vulnerabilities – Tools for Identifying Vulnerabilities – Countermeasures.

UNIT – V PENETRATION TESTING [9]

Introduction – Security Assessments – Types of Penetration testing – Phases of Penetration Testing – Tools –Test Tools – Penetration Testing Tools.

Total = 45 Periods

Reference Books :

1 Patrick Engebretson, The Basics of Hacking and Penetration Testing – Ethical Hacking and Penetration Testing Made Easy, Syngress Media, Mexico, Second Edition, 2013.
2 Michael T. Simpson, Kent Backman and James E. Corley, Hands-On Ethical Hacking and Network Defense, Delmar Cengage Learning, US, First Edition, 2012
3 Jon Erickson, Hacking: The Art of Exploitation, No Starch Press, California, Second Edition, 2008.
4 Ec-Council, Ethical Hacking and Countermeasures: Attack Phases, Delmar Engage Learning, US, Second Edition, 2009

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SEMESTER – III(ELECTIVE)

CS20366	**WEB TECHNOLOGY**	L	T	P	C
		3	0	0	3

Course Outcomes: On Completion of this course, the student will be able to		***Cognitive Level***
CO1:	*Summarize the web concepts for designing a simple web site.*	*Understand*
CO2:	*Demonstrate client side programming using scripts*	*Understand*
CO3:	*Demonstrate server side programming using ASP and JSP.*	*Understand*
CO4:	*Represent the web data using XML.*	*Understand*
CO5:	*Build web applications using open source environment.*	*Create*

UNIT – I FUNDAMENTALS OF WEB [9]

Web Essentials – Clients-Servers Communication – Markup Languages – XHTML – Simple XHTML pages style sheets – Cascading Style Sheets – Features – CSS core syntax – Style rule cascading and inheritance – Text properties – Box model – Normal flow – Beyond the normal flow – Lists – Tables – Cursor Styles.

UNIT – II CLIENT-SIDE PROGRAMMING [9]

Introduction to scripting – Control statements – Functions – Operators – Arrays– Java script objects – Built-in objects – Host objects: Browsers and Document Object Model

UNIT – III SERVER-SIDE PROGRAMMING [9]

Java Servlets – Servlet Architecture – Servlet Life Cycle-Parameter Data-Uniform Resource Locator Rewriting – Servlet Capabilities – Data Storage – Servlets and Concurrency –Separating Programming and presentation – ASP/JSP – JSP basics ASP/JSP objects – Simple ASP/JSP pages.

UNIT – IV REPRESENTING WEB DATA [9]

XML Documents and Vocabularies – Versions – Namespace – Document Type Definition – XML Schema –Document Object Model Based XML processing – Event Oriented Parsing: SAX (Simple API for XML) – Transforming XML Documents – Selecting XML Data: XPath – Template based Transformation XSLT

UNIT – V BUILDING WEB APPLICATIONS [9]

Introduction – Cookies – Sessions – Open Source Environment – PHP – Data type –Numbers – Strings – Arrays – Changing data type - Regular expression – Program Control –Built-in functions.

Total = 45 Periods

Reference Books :

1. Jeffrey C Jackson, Web Technologies – A Computer Science Perspective, Pearson Education, New Delhi, Second Edition, 2012.
2. Chris Bates, Web Programming – Building Internet Applications, Wiley India, New Delhi, First Edition, 2007
3. Paul J. Deital, Harvey M. Deital, Internet and World Wide Web – How to Program, Pearson Education, New Delhi, Fourth Edition, 2011.
4. Heather Williamson, The Complete Reference XML, Tata McGraw Hill, New Delhi, First Edition, 2009.

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SEMESTER – III(ELECTIVE)

CS20367	**COST MANAGEMENT OF ENGINEERING PROJECTS**	L	T	P	C
		3	0	0	3

Course Outcomes: On Completion of this course, the student will be able to		***Cognitive Level***
CO1:	*Summarize the overview of the strategic cost management process.*	*Remember*
CO2:	*Analyze the various stages of project execution and commissioning.*	*Analyze*
CO3:	*Outline the cost behavior and profit planning marginal costing.*	*Create*
CO4:	*Analyze the various planning techniques and budgetary control*	*Analyze*
CO5:	*Discuss about Quantitative techniques for cost management.*	*Understand*

UNIT – I **OVERVIEW OF THE STRATEGIC COST MANAGEMENT PROCESS** **[9]**

Introduction and Overview of the Strategic Cost Management Process – Cost concepts in decision-making – Relevant cost – Differential cost, Incremental cost and Opportunity cost – Objectives of a Costing System – Inventory valuation; Creation of a Database for operational control – Provision of data for Decision-Making.

UNIT – II **PROJECT EXECUTION AND COMMISSIONING** **[9]**

Project: Meaning – Different types – Manage – Various stages of project execution: conception to commissioning – Project execution as conglomeration of technical and nontechnical activities – Detailed Engineering activities – Pre project execution main clearances and documents Project team: Role of each member – Importance Project site: Data required with significance – Project contracts – Types and contents – Project execution and Project cost control– Project commissioning: mechanical and process.

UNIT – III **COST BEHAVIOR AND PROFIT ANALYSIS** **[9]**

Cost Behavior and Profit Planning Marginal Costing – Distinction between Marginal Costing and Absorption Costing – Break-even Analysis – Cost-Volume – Profit Analysis – Various decision-making problems – Standard Costing and Variance Analysis. Pricing strategies: Pareto Analysis – Target costing – Life Cycle Costing – Costing of service sector.

UNIT – IV **PLANNING AND BUDGETARY CONTROL** **[9]**

Material Requirement Planning – Enterprise Resource Planning – Total Quality Management and Theory of constraints – Activity-Based Cost Management– Bench Marking – Balanced Score Card and Value-Chain Analysis – Budgetary Control – Flexible Budgets – Performance budgets – Zero-based budgets – Measurement of Divisional profitability pricing decisions including transfer pricing.

UNIT –V **QUANTITATIVE TECHNIQUES** **[9]**

Quantitative techniques for cost management – Linear Programming – PERT/CPM – Transportation problems – Assignment problems– Simulation – Learning Curve Theory.

Total = 45 Periods

Reference Books :

1 harles T. Horngren, Cost Accounting A Managerial Emphasis, Pearson Education, India, Thirteen Edition, 2009.
2 Ahmed Riahi-Belkaoui, Advanced Management Accounting, Greenwood Publishing Group, California, Fifth Edition, 2001
3 Robert S. Kaplan, Anthony A. Atkinson, Advanced Management Accounting, Prentice Hall, US, First Edition, 1998.
4 Ashish K. Bhattacharya, Principles & Practices of Cost Accounting, PHI Learning Pvt. Ltd, New Delhi, Third Edition, 2004.

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SEMESTER – III(ELECTIVE)

CS20368	**INFORMATION SECURITY**	L	T	P	C
		3	0	0	3

Course Outcomes: On Completion of this course, the student will be able to		***Cognitive Level***
CO1:	*Summarize the overview of the computer security.*	*Remember*
CO2:	*Analyze the key management techniques.*	*Analyze*
CO3:	*Outline the system design principles and access control mechanisms.*	*Create*
CO4:	*Discuss about* malicious logic and intrusion detection	*Understand*
CO5:	*Describe about* network security and anticipating attacks	*Remember*

UNIT – I OVERVIEW OF COMPUTER SECURITY [9]

An Overview of Computer Security – Access Control Matrix – Policy – Security policies, Confidentiality policies – Integrity policies and Hybrid policies.

UNIT – II KEY MANAGEMENT [9]

Cryptography – Key management – Session and Interchange keys – Key exchange and generation – Cryptographic Key Infrastructure – Storing and Revoking Keys – Digital Signatures – Cipher Techniques.

UNIT –III DESIGN AND ACCESS CONTROL [9]

Systems: System Design Principles – Representing Identity – Access Control Mechanisms –Introduction to assurance.

UNIT – IV MALICIOUS LOGIC AND INTRUSION DETECTION [9]

Malicious Logic: Trojan Horses – Viruses – Worms – Other forms – Defenses – Vulnerability Analysis: Introduction – Penetration Studies – Classification – Framework – Auditing and Intrusion Detection.

UNIT –V SECURITY [9]

Network Security: Policy Development – Network Organization – Availability and Network Flooding – Anticipating attacks – System Security – User Security and Program Security.

Total = 45 Periods

Reference Books :

1 Matt Bishop, Sathyanarayana S. Venkatramanayya Introduction to Computer Security, Pearson Education, New Delhi, Second Edition, 2009
2 Mark Merkow, James Breithaupt Information Security: Principles and Practices, Pearson Education, New Delhi, First Edition, 2007
3 Whitman,Principles of Information Security, Pearson Education, New Delhi, Second Edition, 2011
4 William Stallings,Cryptography and Network Security: Principles and Practices, Pearson Education, New Delhi, Fifth Edition, 2011.

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SEMESTER – III(ELECTIVE)

CS20369	**SOCIAL NETWORK ANALYSIS**	L	T	P	C
		3	0	0	3

Course Outcomes: On Completion of this course, the student will be able to		***Cognitive Level***
CO1:	Develop semantic web related applications.	*Understand*
CO2:	Represent knowledge using ontology.	*Understand*
CO3:	Predict human behaviour in social web and related communities.	*Analyze*
CO4:	Visualize social networks.	*Evaluate*
CO5:	Study the applications of social networks.	*Analyze*

UNIT – I SEMANTIC WEB AND SOCIAL NETWORKS [9]

Introduction to Semantic Web: Limitations of Current Web – Development of Semantic Web – Emergence of the Social Web – Social Network Analysis: Development of Social Network Analysis – Key Concepts and Measures in Network Analysis.

UNIT – II SEMANTIC TECHNOLOGY FOR SOCIAL NETWORK ANALYSIS [9]

Electronic Sources for Network Analysis: Electronic Discussion Networks, Blogs and Online communities – Web Based Networks – Ontology Based Knowledge Representation – Resource Description Framework – Web Ontology Language – Modeling and Aggregating Social Network Data: State-of-the-Art in Network Data Representation – Ontological Representation of Social Individuals – Ontological Representation of Social Relationships – Aggregating and Reasoning with Social Network Data.

UNIT –III EXTRACTION AND MINING COMMUNITIES IN WEB SOCIAL NETWORKS [9]

Detecting Communities in Social Networks – Definition of Community – Evaluating Communities – Methods for Community Detection and Mining – Applications of Community Mining Algorithms – Tools for Detecting Communities – Social Network Infrastructures and Communities – Decentralized Online Social Networks – Challenges of DOSNs – General Purpose DOSNs.

UNIT – IV PREDICTING HUMAN BEHAVIOUR AND PRIVACY ISSUES [9]

Understanding and Predicting human Behaviour for Social Communities – User Data Management, Inference and Distribution – Enabling New Human Experiences – The Technologies – Privacy in Online Social Networks – Trust in Online Environment – Trust Models Based on Subjective Logic – Trust Network Analysis – Trust Transitivity Analysis – Combining Trust and Reputation – Trust Derivation Based on Trust Comparisons.

UNIT –V VISUALIZATION AND APPLICATIONS OF SOCIAL NETWORKS [9]

Graph theory – Centrality – Clustering – Node-Edge Diagrams – Matrix Representation – Visualizing Online Social Networks, Visualizing Social Networks with Matrix Based Representations – Matrix and Node Link Diagrams – Hybrid Representations – Applications – Cover Networks – Community Welfare-Collaboration networks – Co-Citation Networks.

Total = 45 Periods

Reference Books :

1 GuandongXu, Yanchun Zhang and Lin Li, Web Mining and Social Networking – Techniques and applications, Springer, New York, First Edition, 2011

2 BorkoFurht, Handbook of Social Network Technologies and Applications, Springer, New York, First Edition, 2010

3 John G. Breslin, Alexander Passant and Stefan Decker, The Social Semantic Web, Springer, New York, First Edition, 2009.

4 Peter Mika, Social Networks and the Semantic Web, Springer, New York, First Edition, 2007

5 Dion Goh and Schubert Foo, Social information Retrieval Systems: Emerging Technologies and Applications for Searching the Web Effectively, IGI Global Snippet, India, Fourth Edition, 2008.

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SEMESTER – III(ELECTIVE)

CS20371	**OBJECT ORIENTED SOFTWARE ENGINEERING**	L	T	P	C
		3	0	0	3

Course Outcomes: On Completion of this course, the student will be able to		***Cognitive Level***
CO1:	Summarize the fundamentals of software engineering.	*Evaluate*
CO2:	Analyze the requirements of software, object model and dynamic model .	*Apply*
CO3:	Outline the system design concepts	*Analyze*
CO4:	Describe the object design and implementation issues.	*Apply*
CO5:	Discuss the project management concepts.	*Evaluate*

UNIT – I FUNDAMENTALS OF SOFTWARE ENGINEERING [9]

System Concepts – Software Engineering Concepts: Participation and roles, Systems and models, Work products, Activities, Tasks and Resources, Functional and Nonfunctional Requirements, Notations, Methods and Methodologies – Development Activities: Requirements Elicitation, Analysis, System Design, Object Design, Implementation, Testing – Managing –Software Development: Communication, Rationale Management, Software Configuration Management, Project management, Software Life Cycle – Unified Modeling Language: An overview, Modeling Concepts – Project Organization Concepts: Project Organizations, Roles, Tasks and Work Products, Schedule – Communication: Planned, Unplanned, Communication Mechanisms.

UNIT – II ANALYSIS [9]

Requirements Elicitation – Concepts: Functional Requirements, Nonfunctional Requirements, Completeness, Consistency, Clarity, Correctness, Realism, Verifiability, Traceability Greenfield Engineering, Reengineering and Interface Engineering – Activities: Identifying Actors, Scenarios, Use cases, Refining Use Cases, Identifying Relationships among Actors and Use Cases, Identifying Initial Analysis Objects and Non Functional Requirements – Management: Negotiating Specifications with clients, Maintaining Traceability, Documenting Requirements Elicitation – Analysis Object Model – Analysis Dynamic Models

UNIT – III SYSTEM DESIGN [9]

Decomposing the system – Overview of System Design – System Design Concepts: Subsystems and classes, Services and Subsystem Interfaces, Coupling and Cohesion, Layers and Partitions, Architectural Styles – System Design Activities: Analysis Model for a Route Planning System, Identifying Design Goals, Identifying Subsystems – Addressing Design Goals: Mapping Subsystems to Processors and Components, Identifying and Storing Persistent Data, Providing Access Control, Designing the Global Control Flow, Identifying Boundary Conditions, Reviewing System Design – Managing System Design: Documenting System Design, Assigning Responsibilities, Communicating about System Design, Iterating over the System Design

UNIT – IV OBJECT DESIGN AND IMPLEMENTATION ISSUES [9]

Reusing Pattern Solutions: Reuse Concepts, Reuse Activities, Managing Reuse – Specifying Interfaces: Interface Specification Concepts, Interface Specification Activities, Managing Object Design – Mapping Models to Code: Mapping Concepts, Mapping Activities, Managing Implementation – Testing: Concepts, Activities and Management.

UNIT –V MANAGING CHANGE [9]

Rationale Management: Concepts, Activities, Management – Configuration Management: Concepts, Activities, Management – Project Management: Concepts, Activities – Software Life Cycle: IEEE 1074, Characterizing The Maturity, Life Cycle Models.

Total = 45 Periods

Reference Books :

1. Bernd Bruegge, Alan H Dutoit, Object-Oriented Software Engineering, Pearson Education, New Delhi, Third Edition, 2011.
2. Craig Larman, Applying UML and Patterns, Pearson Education, New Delhi, Third Edition, 2011.
3. Stephen Schach, Software Engineering, McGraw-Hill, New Delhi, Eighth Edition, 2010.
4. Yogesh Singh, Ruchika Malhotra, Object-Oriented Software Engineering, PHI Learning, New Delhi, Second Edition, 2012.

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SEMESTER – III(AUDIT COURSE)

CS203A1	**ENGLISH FOR RESEARCH PAPER WRITING**	L	T	P	C
		3	0	0	0

Course Outcomes: On Completion of this course, the student will be able to		***Cognitive Level***
CO1:	*Formulate the planning and preparation for paper writing.*	*Create*
CO2:	*Recognize how to avoid the plagiarism.*	*Apply*
CO3:	*Analyze how to prepare for literature survey.*	*Analyze*
CO4:	*Describe the skills for writing title, abstract and introduction.*	*Understand*
CO5:	*Summarize skills for writing methods results and discussion.*	*Evaluate*

UNIT – I PLANNING AND PREPARATION [5]

Planning and Preparation – Word Order – Breaking up long sentences – Structuring Paragraphs and Sentences – Being Concise and Removing Redundancy – Avoiding Ambiguity and Vagueness.

UNIT – II PARAPHRASING AND PLAGIARISM [5]

Clarifying Who Did What – Highlighting Your Findings – Hedging and Criticizing – Paraphrasing and Plagiarism – Sections of a Paper – Abstracts.

UNIT – III LITERATURE SURVEY [5]

Review of the Literature – Methods – Results – Discussion – Conclusions – Final Check.

UNIT – IV ABSTRACT AND LITERATURE REVIEW [5]

Key skills are needed when writing a Title – Key skills are needed when writing an Abstract – Key skills are needed when writing an Introduction – Skills needed when writing a Review of the Literature.

UNIT – V RESULTS AND CONCLUSIONS [5]

Skills are needed when writing the Methods – Skills needed when writing the Results – Skills are needed when writing the Discussion – Skills are needed when writing the Conclusions.

Total = 25 Periods

Reference Books :

1. Adrian Wallwork, English for Writing Research Papers, Springer, New York Dordrecht Heidelberg London, Fifth Edition, 2016.
2. Day R, How to Write and Publish a Scientific Paper, Cambridge University Press, US, First Edition, 2011.
3. Highman N, Handbook of Writing for the Mathematical Sciences, SIAM. Highman's book, USA, Second Edition, 2011
4. GoldbortR, Writing for Science, Yale University Press, Connecticut, Third Edition, 2006.

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SEMESTER – III(AUDIT COURSE)

CS203A2 **DISASTER MANAGEMENT**

L	T	P	C
3	0	0	0

Course Outcomes: On Completion of this course, the student will be able to		***Cognitive Level***
CO1:	*Evaluate the types and magnitude of disasters and hazards.*	*Understand*
CO2:	*Get the idea of various disaster-prone areas in India.*	*Understand*
CO3:	*Summarize the idea of preparedness and management of disaster.*	*Evaluate*
CO4:	*Analyze the various risk assessment techniques.*	*Analyze*
CO5:	*Be familiar with the concept of strategies of disaster mitigation.*	*Apply*

UNIT – I BASICS OF DISASTER [5]

Disaster: Definition Factors and Significance – Difference Between Hazard and Disaster – Natural and Manmade Disasters: Difference – Nature – Types and Magnitude – Repercussions of Disasters and Hazards: Economic Damage – Loss of Human and Animal Life – Destruction of Ecosystem. Natural Disasters: Earthquakes – Volcanisms – Cyclones –Tsunamis – Floods – Droughts and Famines – Landslides and Avalanches.

UNIT – II DISASTER PRONE AREAS IN INDIA [5]

Study of Seismic Zones –Areas Prone to Floods and Droughts – Landslides and Avalanches – Areas Prone to Cyclonic and Coastal Hazards With Special Reference to Tsunami – Post-Disaster Diseases and Epidemics.

UNIT – III DISASTER PREPAREDNESS AND MANAGEMENT [5]

Preparedness: Monitoring of Phenomena triggering Disaster or Hazard – Evaluation of Risk: Application of Remote Sensing – Data From Meteorological and Other Agencies – Media Reports: Governmental and Community Preparedness.

UNIT – IV RISK ASSESSMENT [5]

Disaster Risk: Concept and Elements – Disaster Risk Reduction – Global and National Disaster risk Situation. Techniques of risk Assessment – Global Co-Operation In Risk Assessment and Warning – People's Participation In Risk Assessment. Strategies for Survival.

UNIT – V DISASTER MITIGATION [5]

Meaning, Concept and Strategies of Disaster Mitigation – Emerging Trends in Mitigation – Structural Mitigation and Non-Structural Mitigation – Programs of Disaster Mitigation In India.

Total = 25 Periods

Reference Books :

1 R. Nishith, Singh AK, and Disaster Management in India: Perspectives, issues and strategies, New Royal book Company, Luck now, Second Edition, 2012.
2 Sahni, Pardeep Et.Al (Eds.), Disaster Mitigation Experiences And Reflections, Prentice Hall of India, New Delhi, First Edition, 2011.
3 Goel S. L., Disaster Administration, Management Text, Case Studies, Deep & Deep Publication Pvt. Ltd., New Delhi, First Edition, 2011.
4 Sathish Modh, Introduction to Disaster Management, Macmillan, New Delhi, Seventh Edition, 2014

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SEMESTER – III(AUDIT COURSE)

CS203A3	**VALUE EDUCATION**	L	T	P	C
		3	0	0	0

Course Outcomes: On Completion of this course, the student will be able to		***Cognitive Level***
CO1:	*Analyze the knowledge of self-development.*	*Analyze*
CO2:	*Analyze the importance of human values.*	*Analyze*
CO3:	*Develop the overall personality.*	*Understand*
CO4:	*Infer the importance of behavior development.*	*Understand*
CO5:	*Identify the self-management and good health.*	*Evaluate*

UNIT – I VALUES AND SELFDEVELOPMENT [5]

Values and self-development – Social values and individual attitudes – Work ethics – Indian vision of humanism – Moral and non-moral valuation – Standards and principles – Value judgments.

UNIT – II CULTIVATION OF VALUES [5]

Importance of cultivation of values – Sense of duty – Devotion – Self-reliance – Confidence –Concentration – Truthfulness – Cleanliness – Honesty – Humanity – Power of faith – National Unity –Patriotism – Love for nature –Discipline.

UNIT – III PERSONALITY DEVELOPMENT [5]

Personality and Behavior Development – Soul and Scientific attitude – Positive Thinking – Integrity and discipline – Punctuality – Love and Kindness – Avoid fault Thinking – Free from anger – Dignity of labour.

UNIT – IV BEHAVIOR DEVELOPMENT [5]

Universal brotherhood and religious tolerance – True friendship – Happiness Vs suffering – Love for truth – Aware of self-destructive habits – Association and Cooperation – Doing best for saving nature.

UNIT – V CHARACTER AND COMPETENCE [5]

Character and Competence – Holy books Vs Blind faith – Self-management and Good health – Science of reincarnation – Equality – Nonviolence – Humility – Role of Women – All religions and same message – Mind your Mind – Self-control Honesty – Studying effectively.

Total = 25 Periods

Reference Books :

1 Y.K. Singh, Value Education, APH Publishing, New Delhi, Second Edition, 2008.

2 R. P. Shukla, Value education and human rights, Sarup & Sons, New Delhi, First Edition, 2004.

3 Chakroborty, S.K. Values and Ethics for organizations Theory and practice, Oxford University Press, New Delhi, First Edition, 1998.

4 Gupta N L, Natthūlāla Gupta, Human Values in Education, Concept Publishing Company, New Delhi, First Edition, 2000.

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SEMESTER – III(AUDIT COURSE)

CS203A4	**CONSTITUTION OF INDIA**	L	T	P	C
		3	0	0	0

Course Outcomes: On Completion of this course, the student will be able to		***Cognitive Level***
CO1:	*Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi Indian politics.*	*Remember*
CO2:	*Describe the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.*	*Remember*
CO3:	*Identify the circumstances surrounding the foundation of the congress socialist party [CSP] under the leadership of Jawaharlal Nehru.*	*Evaluate*
CO4:	*Illustrate the eventual failure of the proposal of direct elections through adult suffrage in the indian constitution.*	*understand*
CO5:	*Outline the passage of the hindu code bill of 1956*	*Remember*

UNIT – I HISTORY AND PHILOSOPHY [5]

History of Making of the Indian Constitution: History – Drafting Committee (Composition and Working) – Philosophy of the Indian Constitution: Preamble – Salient Features.

UNIT – II CONTOURS OF CONSTITUTIONAL RIGHTS AND DUTIES [5]

Contours of Constitutional Rights and Duties: Fundamental Rights – Right to Equality – Right to Freedom – Right against Exploitation – Right to Freedom of Religion – Cultural and Educational Rights – Right to Constitutional Remedies – Directive Principles of State Policy – Fundamental Duties.

UNIT – III ORGANS OF GOVERNANCE [5]

Organs of Governance: Parliament – Composition – Qualifications and Disqualifications – Powers and Functions – Executive – President – Governor – Council of Ministers – Judiciary, Appointment and Transfer of Judges, Qualifications – Powers and Functions.

UNIT – IV LOCAL ADMINISTRATION [5]

Local Administration: Districts Administration head: Role and Importance –Municipalities: Introduction – Mayor and role of Elected Representative – CEO of Municipal Corporation. Pachayati raj: Introduction, PRI: ZilaPachayat. Elected officials and their roles – CEO ZilaPachayat: Position and role. Block level: Organizational Hierarchy (Different departments)– Village level: Role of Elected and Appointed officials –Importance of grass root democracy.

UNIT – V ELECTION COMMISSION [5]

Election Commission: Election Commission: Role and Functioning – Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning – Institute and Bodies for the welfare of SC/ST/OBC and women.

Total = 25 Periods

Reference Books :

1 The Constitution of India, 1950 (Bare Act), Government Publication, India, First Edition, 2000

2 Dr. S. N. Busi, Dr. B. R. Ambedkar, Framing of Indian Constitution, India, First Edition, 2016.

3 M. P. Jain, Indian Constitution Law, Lexis Nexis, India, Seventh Edition, 2014.

4 D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, India, Fourth Edition, 2015.