B. V. V. Sangha's

BASAVESHWARA ENGINEERING COLLEGE (AUTONOMOUS), BAGALKOT

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Syllabus for M. Tech. (CSE) for the 2018-19 Admitted Batch

Semester-I:

Sl. No	Subject Code	Name of the Subjects	Credits	Hours / Week			Exam Marks		
				L	T	P	CIE	SEE	Total
1	PCS141C	Advanced Algorithms	4	3	2	0	50	50	100
2	PCS142C	Big Data Analytics	4	3	2	0	50	50	100
3	PCS002E	Computer Graphics & Visualization	4	4	0	0	50	50	100
4	PCS009E	Cryptography and Network Security	4	4	0	0	50	50	100
5	PCS038E	Advances in Operation Systems	4	4	0	0	50	50	100
6	PCS143L	Computing Lab-1 (Advanced Algorithms)	1	0	0	2	50	50	100
Total			**21**	**18**	**4**	**2**	**300**	**300**	**600**

LIST OF ELECTIVE COURSES FOR I, II and III SEMESTER OF M.TECH (CSE) 2009-2010 Onwards

Sl. No.	Subject Code	Subjects	L	T	P	C
1	PCS001E		4	0	0	4
2	PCS002E	Computer Graphics and Visualization	4	0	0	4
3	PCS003E	Digital Image Processing	4	0	0	4
4	PCS004E	Object Technology	4	0	0	4
5	PCS005E	Digital Signal Processing	4	0	0	4
6	PCS006E	Machine Learning	4	0	0	4
7	PCS007E	Distributed Systems	4	0	0	4
8	PCS008E					
9	PCS009E	Cryptography & Network Security	4	0	0	4
10	PCS010E	Pattern Recognition	4	0	0	4
11	PCS011E					
12	PCS012E					
13	PCS013E					
14	PCS014E	Multi core Programming	4	0	0	4
15	PCS015E					
16	PCS016E					
17	PCS017E	Soft Computing	4	0	0	4
18	PCS018E	Computer vision	4	0	0	4
19	PCS019E	System software and Compiler Design	4	0	0	4
20	PCS020E	Software Quality Engineering	4	0	0	4
21	PCS021E	Pervasive Computing	4	0	0	4
22	PCS022E	Database Management Systems	4	0	0	4
23	PCS023E	Storage area Networks	4	0	0	4
24	PCS024E	Grid and cluster Computing	4	0	0	4
25	PCS025E	Parallel Computing	4	0	0	4
26	PCS026E	Data Mining	4	0	0	4
27	PCS027E	Algorithmic Graph Theory	4	0	0	4
28	PCS028E	Wireless and Mobile Communication	4	0	0	4
29	PCS029E	Real Time Systems	4	0	0	4
30	PCS030E	Multimedia Computing	4	0	0	4
31	PCS031E	Finite Automata and Formal Languages	4	0	0	4
32	PCS032E	Mobile Computing	4	0	0	4
33	PCS033E	Compiler Design	4	0	0	4
34	PCS034E	Cloud Computing	4	0	0	4
35	PCS035E	Web Services	4	0	0	4
36	PCS036E	Big Data Analytics	4	0	0	4
37	PCS037E	Wireless Ad-Hoc Networks	4	0	0	4
38	PCS038E	Advances in Operation Systems	3	2	0	4

PCS141C

Advanced Algorithms
4 CREDITS (3-2-0)

Unit-I **L-12 Hours**

Amortized Analysis: Aggregate, Accounting and Potential Methods. Graph Algorithms: Bellman - Ford Algorithm; Johnson's Algorithm for sparse graphs; Flow networks and Ford-Fulkerson method; Maximum bipartite matching. Polynomials and the FFT Representation of polynomials; the DFT and FFT; Efficient implementation of FFT. 12 Hours

Unit-II **L-12 Hours**

Number -Theoretic Algorithms: Elementary notions; GCD; Modular Arithmetic; Solving modular linear equations; The Chinese remainder theorem; Powers of an element; RSA cryptosystem; Primality testing; Integer factorization. String-Matching Algorithms: Naive string Matching; Rabin - Karp algorithm; String matching with finite automata; Knuth-Morris-Pratt algorithm Boyer – Moore algorithms. 12 Hours

Unit-III **L-12 Hours**

Probabilistic and Randomized Algorithms: Probabilistic Algorithms, randomizing deterministic algorithms, Monte Carlo and Las Vegas Algorithms, Probabilistic numerical algorithms, Probabilistic parallel algorithms: NP-Complete Problems, The classes P and NP, Reducibility, NP- complete problems: Cook's theorem, Sample NP-complete problems, the class co-NP, The Classes NC and P-Complete Approximation Algorithms Bin Packing, The Steiner tree problem, the facility location problem. 12 Hours

Unit-IV **L-12 Hours**

Introduction to parallel algorithms and architectures: Approaches to the design of parallel algorithms, Architectural constraints and design of parallel algorithms, Performance measures of parallel algorithms, parallel sorting Internet algorithms Search Engines, Ranking web pages, Hashing, Caching, content delivery and consistent hashing, Message security algorithms. 12 Hours

Total L (Lecture) **48 Hours**

Text Books :

1. T. H Cormen, C E Leiserson, R L Rivest and C Stein: **"Introduction to Algorithms"**, 2nd Edition, Prentice-Hall of India, 2002.
2. Kenneth A. Berman and Jerome L. Paul: **"Algorithms"**, Cengage Learning, 2002.

Reference Books :

1. Ellis Horowitz, Sartaj Sahni, S.Rajasekharan: "**Fundamentals of Computer Algorithms"**, 2nd Edition, University Press, 2007. Alfred V. Aho,John E. Hopcroft, J.D.Ullman: "**The Design and Analysis of Computer Algorithms"**, Addison-Wesley, 1974.

Course Outcomes :

1. Analyze randomized algorithms. Employ indicator random variables and linearity of expectation to perform the analyses. Recite analyses of algorithms that employ this method of analysis.
2. Understand the different methods of amortized analysis (aggregate analysis, accounting and potential method). Perform amortized analysis.
3. Know major string matching algorithms and compare efficiencies of different algorithms.
4. Know the wide range of advanced algorithmic problems, their

relations and variants, and application to real-world problems.

5. Identify the different ways to analyze randomized algorithms (expected running time, probability of error). Recite algorithms that employ randomization.

PCS142C

BIG DATA AND ANALYTICS
4 CREDITS (3-2-0)

Unit-I **L-12 Hours**

Types of digital data: 12 Hours

Types of Digital Data, Structured: Sources of structured data, Ease with Structured data, Semi-Structured: Sources of semi-structured data, Unstructured: Sources of unstructured data, Issues with terminology, Dealing with unstructured data.

Big Data:

Characteristics of data, What big data? Definitions and Challenges of big data, other characteristics of data which are not definitional traits of big data, Why big data? Are we just an information consumer or do we also produce information? Traditional Business Intelligence(BI) versus Big data, A typical BI environment, A big data environment, Big data stack, What is changing in the realms of big data?

Big data analytics:

Where do we begin? What is big data analytics? What big data analytics isn't? Why this sudden hype around big data analytics? Classification of analytics top challenges facing big data, why is big data analytics important? Greatest challenges that prevent businesses from capitalizing on big data, what kind of technologies are we looking towards to help meet the challenges posed by big data? Data science, Data Scientist – your new best friend!!!, Terminologies used in big data environment, In memory analytics, In database processing, Massively parallel processing, Parallel versus distributed systems, Shared Memory architecture, Consistency, Availability, Partition Tolerance (CAP) theorem explained, Basically Available Soft State Eventual Consistency (BASE), Few top Analytics tools, Introduction to Jasper Report using Jasper Soft Studio.

Unit-II **L-12 Hours**

The big data technology landscape: 12 Hours

NoSQL, Where is it used? What is it? Types of NoSQL databases, Why NoSQL? Advantages of NoSQL, What we miss with NoSQL? NoSQL Vendors, SQL Versus NoSQL, NewSQL, Comparison of SQL, NoSQL and NewSQL, Hadoop: Features of Hadoop, Key advantages of Hadoop,Versions of Hadoop, Hadoop 1.0, Hadoop 2.0, Overview of Hadoop Ecosystems, Hadoop Versus, SQL, Integrated Hadoop systems offered by leading market vendors, Cloud based Hadoop solutions.

Hadoop:

Introducing Hadoop, Why not RDBMS, Distributed Computing Challenges, Brief History of Hadoop, Hadoop Overview, Hadoop Components, High Level Architecture of Hadoop, Hadoop Distributed File System(HDFS), HDFS Architecture, Daemons Related to HDFS, Working with HDFS Command, Special Features of Hadoop, Processing Data With Hadoop,Introduction, How Map Reduce Works? Map Reduce Example, Word Count Example using Java.

Managing Resources and Applications with YARN:

Introduction, Limitation of Hadoop 1.0, Hadoop 2: HDFS, Hadoop 2: YARN, Interacting with Hadoop EcoSystem, Hive,Pig, HBASE, Sqoop, Business Intelligence on Hadoop.

Unit-III **L-12 Hours**

NoSQL - MongoDB: 12 Hours

What is MongoDB? Why MongoDB? Using JSON, Creating or generating a unique key, Support for dynamic queries, Storing binary data, Replication, Sharding, Updating information in-place, Terms used in RDBMS and MongoDB, Data types in MongoDB,

MongoDB - CRUD (Insert(), Update(), Save(), Remove(), find()), MongoDB- Arrays, Java Scripts, Cursors, Map Reduce Programming, Aggregations.

NoSQL - Cassandra:

What is Cassandra? Why Cassandra? Peer to peer network, Gossip and Failure detection, Anti-Entropy & Read Repair, Writes in Cassandra, Hinted handoffs, Tunable consistency, Cassandra- CQLSH - CRUD, Counter, List, Set, Map, Tracing.

Unit-IV **L-12 Hours**

Hadoop Hive: 12 Hours

Introduction to Hive - The Problem, Solution - Hive Use Case, Data Growth, Schema Flexibility and Evolution, Extensibility, What is Hive, History of Hive and Recent Releases of Hive, Hive Features, Hive Integration and Work Flow, Hive Data Units, Hive Architecture, Hive Primitive Data Types and Collection Types, Hive File Formats, Hive Query Language - Statements, DDL , DML, Hive Partitions, Bucketing, Views, Sub Query, Joins, Hive User Defined Function, Aggregations in Hive, Group by and Having, Serialization and Deserialization, Hive Analytic Functions.

Hadoop - Pig:

Introducing Pig, History and Anatomy of Pig, Pig on Hadoop, Pig Features, Pig Philosophy, Word count example using Pig, Use Case for Pig, Pig Primitive Data Types, Colletion Types and NULL, Pig Latin Overview, Pig Latin Grammar - Comments, Keywords, Identifiers, Case sensitivity in Pig, Common Operators in Pig, Pig Statements, LOAD, STORE, DUMP, Interactive Shell - GRUNT, FILTER,SORT,GROUP BY,ORDER BY, JOIN, LIMIT, Pig Latin Script, Local Mode,Map Reduce Mode, Running Pig Script,Working with Field, Tuple, Bag,User Defined Function, Parameters in Pig.

Total L (Lecture) **48 Hours**

Text Books :

1. Big Data and Analytics, Seema Acharya and Subhashini Chellappan – Wiley India, 2015.

Reference Books :

1. Frank J Ohlhorst, “Big Data Analytics: Turning Big Data into Big Money”, Wiley and SAS Business Series, 2012.
2. Michael Berthold, David J. Hand, Intelligent Data Analysis, Springer, 2007.
3. Paul Zikopoulos, Dirk deRoos, Krishnan Parasuraman, Thomas Deutsch, James Giles, David Corrigan, “Harness the Power of Big data – The big data platform”, McGraw Hill, 2012.
4. Michael Minelli, Michehe Chambers, “Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today’s Business”, 1st Edition, Ambiga Dhiraj, Wiely CIO Series, 2013.

Course Outcomes :

1. Explain the significance, characteristics and challenges of big data in storage, analysis and manipulation of data.
2. Differentiate various Big data technologies like Hadoop MapReduce, Pig, Hive, MongoDB and Cassandra.
3. Comprehend the significance of NoSQL and NewSQL databases.
4. Apply the knowledge of computing tools and techniques in the field of Big Data for solving real world problems.
5. Identify the challenges in Big Data with respect to IT Industry and pursue quality research.

PCS002E

COMPUTER GRAPHICS AND VISUALIZATION
4 CREDITS (4-0-0)

Unit-I **L-12 Hours**

Application of Computer Graphics, Video-Display Devices: Refresh CRT, Raster display Random Display. Color CRT. Raster scan systems, Introduction to OpenGL, OpenGL Point and Line functions, Line Drawing Algorithm, Circle generating Algorithm, 3D: object representations: Polyhedra, OpenGL Polyhedron Functions, Quadric Surfaces, Super Quadrics, OpenGL Quadric and Super Quadric surface functions. 12 Hours

Unit-II **L-12 Hours**

Basic Two-dimensional transformations, Matrix representation of Homogeneous coordinates, 2D Composite Transformation, Geometric Transformation in 3D, 3D Translation, 3D Rotation, 3D scaling, Other 3D transformations, OpenGL Geometric Transformations, 3D Viewing Coordinate parameters, Orthogonal projections, OpenGL 3D viewing functions. 12 Hours

Unit-III **L-12 Hours**

Visible Surface Detection: Classification of Visible surfaces, Back-Face Detection, Depth-Buffer Method, A-Buffer Method, Scan line Method, Depth sorting Method, BSP- TREE Method, Area- Subdivision method, OpenGL- Visibility Detection Functions, Illumination Models: light sources, Basic illumination models, OpenGL Illumination Functions. 12 Hours

Unit-IV **L-12 Hours**

Graphical User Interface: Interactive Picture construction, OpenGL Interactive Input functions, OpenGL Menu functions, Designing Graphical user Interface, Color Models: Standard Primaries, RGB color model, YIQ Colour models, CMY color model. Computer Animation: Design of Animation Sequences, Motion Specifications, Periodic motions, OpenGL Animation Procedures. 12 Hours

Total L (Lecture) **48 Hours**

Text Books :
1. Computer Graphics with OpenGL, Hearn and Baker, 3rd Edition Pearson Education 2009.

Reference Books :
1. Interactive Computer Graphics A Top-Down Approach with OpenGL, Edward Angel, 5th Edition, Addison Wesley 2008.
2. Computer Graphics Using OpenGL- F. S. Hill , Stephen M. Kelley, 2nd Edition Prentice Hall 2006.

Course Outcomes :
1. Know the architecture of graphics systems and Understand Graphics algorithms.
2. Illustrate 3D object representation using Graphics function.
3. Develop application using transformation functions.
4. Analyze visible surface detection algorithms in 3D object representations.
5. Construct application using viewing, color and illumination models.

PCS009E

CRYPTOGRAPHY AND NETWORK SECURITY
4 CREDITS (4-0-0)

Unit-I **L-12 Hours**

Symmetric Ciphers: 12 Hours

Overview: Services, Mechanisms and Attacks, The OSI Security Architecture, A Model of Network Security. Classical Encryption Techniques: Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Rotor Machines, Steganography. Block Cipher and the Data Encryption Standard: Simplified DES, Block Cipher Principles.

Unit-II **L-12 Hours**

The Data Encryption Standard, The Strength of DES, Differential and Linear Cryptanalysis. Symmetric Ciphers: Triple DES, Blowfish. Confidentiality Using Conventional Encryption: Placement of Encryption Function, Traffic Confidentiality, Key Distribution, Random Number Generation. Public-Key Encryption, Digital signatures and Authentication Protocols: Number Theory: Prime Numbers, Format's and Euler's Theorems, Testing for Primality. Public-Key Cryptography and RSA: Principles of Public Key Cryptosystems, The RSA Algorithm, Key Management, Diffie Hellman Key Exchange. 12 Hours

Unit-III **L-12 Hours**

Message Authentication: Authentication Requirements, Authentication Functions, Message Authentication Codes, MDS Message Digest Algorithm. Digital Signatures and Authentication Protocols: Digital Signatures, Authentication Protocols, Digital Signature Standard. **Network Security:** Authentication Applications: Kerberos, XS09 Directory Authentication Service. Electronic Mail Security: Pretty Good Privacy. 12 Hours

Unit-IV **L-12 Hours**

IP Security: Overview, IP Security Architecture, Authentication Header, Encapsulation Security Payload. Web Security: Web Security Requirements, Secure Sockets Layer and Transport Layer Security, Secure Electronic Transaction. 12 Hours

Total L (Lecture) **48 Hours**

Text Books : 1. William Stallings, Cryptography and Network Security: Principles and Practice, 3rd Edition, Pearson Education, 2002.

Reference Books : 1. William Stallings, Network Security Essentials: Applications and Standards, 5th Edition, Pearson Education, 2013.

Course Outcomes :

1. Identity and analyze the existing security vulnerabilities, services and mechanisms in a computer network and develop a security model to prevent, detect and recover from the attacks.
2. Illustrate the basic concept of encryption and decryption for secure data transmission and apply them.
3. Analyze and compare various cryptography techniques, authentication and key management protocols.
4. Explain the services and mechanisms employed at the different layers of the OSI to provide security.
5. Evaluate the existing computing systems and propose new strategies to secure data communication.

PCS038E

ADVANCES IN OPERATING SYSTEMS
4 CREDITS (4-0-0)

Unit-I **L-12 Hours**

Operating System Overview: 12 Hours

Operating System Objectives and Functions, The Evolution of Operating Systems, Major Achievements, Developments Leading to Modern Operating Systems, Microsoft Windows Overview, Traditional UNIX Systems, Modern UNIX Systems, Linux.

Process Description and Control:

What is a Process? Process States, Process Description, Execution of the Operating System, Security Issues, UNIX SVR4 Process Management.

Threads, SMP, and Microkernels:

Processes and Threads, Symmetric Multiprocessing (SMP), Microkernels, Linux Process and Thread Managements.

Unit-II **L-12 Hours**

Concurrency: Mutual Exclusion and Synchronization: 12 Hours

Principles of Concurrency, Mutual Execution: Hardware Support, Semaphores, Monitors, Message Passing, Readers / Writers Problem.

Concurrency: Deadlock and Starvation:

Principles of Deadlock, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, An Integrated Deadlock Strategy, Dining Philosophers Problems, Dining Philosophers Problems, Linux Kernel Concurrency Mechanisms.

Unit-III **L-12 Hours**

Memory Management and Virtual Memory: 12 Hours

Memory Management requirements, Memory Partitioning, Paging, Segmentation, Securit Issues.

Virtual Memory:

Hardware and Control structures, OS Software, Linux Memory Management.

Multiprocessor and Real-Time Scheduling:

Multiprocessor Scheduling, Real-Time Scheduling, Linux Scheduling.

Unit-IV **L-12 Hours**

Embedded Operating Systems: 12 Hours

Embedded Systems, Characteristics of Embedded Operating Systems, eCOS, TinyOS.

Distributed Processing, Client/server and Clusters:

Client/server Computing, Distributed Message Passing, Remote Procedure, Clusters, Windows Vista Clusters Server.

Total L (Lecture) **48 Hours**

Text Books :

1. William Stallings, "Operating Systems: Internals Design and Principles", 6th edition, Longman, 2009.

Reference Books :

1. Gary Nut, "Operating Systems", Third Edition, Pearson Education. 2006.
2. Mukesh Singhal, Niranjan Shivaratri, "Advanced Concepts in Operating Systems – Distributed, Database and Multiprocessor Operating Systems", Tata McGraw-Hill, 2001.

3. Rajib Mall, “Real-Time Systems: Theory and Practice”, Prentice Hall, 2006.
4. Andrew S. Tanenbaum and Herbert Bos, “Modern Operating Systems”, Fourth Edition, Prentice Hall, 2014.
5. Abraham Silberschatz, Peter B. Galvin, Greg Gagne, “Operating System Concepts”, Wiley, Eighth edition, 2008.

Course Outcomes :

1. Exposed to different operating systems and advancements.
2. Familiar with the concepts like multithreading and synchronization.
3. Having the knowledge of scheduling in multiprocessor systems.
4. Realizing the importance of memory management in operating systems.
5. Having the knowledge of distributed, client-server and cluster environments.

PCS143L

Computing Lab 1 (Advanced Algorithms)
1 CREDIT (0-0-2)

Lab Assignment List

Note: The following programs can be executed on any tool / language.

1. Design and write a program to implement Extended Euclid's algorithm to compute the, greatest common divisor of integers *a* and *b*, also the coefficients of Bézout's identity, which are integers *x* and *y* such that ax+ by= gcd (a,b).
2. Design and write a program to implement a Miller Rabin / Monte Carlo algorithm to test the primality of a given integer and determine its performance.
3. Design and write a program to calculate pow(x,n) i.e for given two integers x and n, compute x^n. Assume that x and n are small and overflow doesn't happen.
4. Design and write a program to implement the Bellman-Ford algorithm to solve the single-source shortest-paths problem and determine its performance.
5. Design and write a program to implement Johnson's algorithm to solve the all pairs shortest path problem, i.e. given an input graph with general edge weights (can be negative) with no negative cycles, find the shortest (u, w) path for all pairs of vertices (u, w). If the input graph has any negative cycles, the program will report this.
6. Design and write a program to implement Ford Fulkerson algorithm to find maximum flow and determine its performance.
7. Design and write a program to solve string matching problem using naïve approach and Boyer Moore approach. Compare the performance.
8. Design and write a program to solve string matching problem using the KMP algorithm. Determine the performance.
9. Design and write program to solve string matching problem using Robin Karp algorithm and determine its performance.
10. Design and write a program to solve string matching problem using Finite Automata and determine its performance.