B. Tech (Computer Science & Engineering)

SEMESTER –VI

Sl No.	Course Code	Course Title	Hours Per Week			Total Credits
			Lecture	Tutorial	Practical	
1.	100602	Computer Networks	3	0	0	3
2.	105601	Complier Design	3	0	0	3
3.	105602	Machine Learning	3	1	0	4
4.	1056XX	Program Elective-I	3	0	0	3
5.	1056XX	Program Elective-II	3	0	0	3
6.	105601P	Complier Design Lab	0	0	4	2
7.	100602P	Computer Networks Lab	0	0	4	2
8.	105620P	Python Programming Lab	0	0	2	1
9.	100604P	NPTEL Courses-2 Lab	0	0	4	2
TOTAL						23

B.Tech (Computer Science & Engineering) **Semester - VI**

List of Program Elective Courses

SL No.	Course Code	Course Title	Remarks
1.	105603	Signals and Systems	Elective-I
2.	105604	Graph Theory	Elective-I
3.	105606	Introduction to Java Programming	Elective-I
4.	105607	Probability and Statistical Inference	Elective-I
5.	105608	Numerical Methods	Elective-I
6.	105609	Information Theory and Coding	Elective-I
7.	105610	Soft Computing	Elective-I
8.	105611	Distributed Database	Elective-I
9.	105612	Advanced Data Structures and Algorithms	Elective-II
10.	105613	Advance Java Programming Language	Elective-II
11.	105614	Web and Internet Technology	Elective-II
12.	105615	Multimedia Technology and its Applications	Elective-II
13.	105616	Cryptography and Network Security	Elective-II
14.	105617	Mobile and Wireless Computing	Elective-II
15.	100610	Computer Graphics	Elective-II

SEMESTER – VI

Course Code- 100602 Computer Networks 3 0 0 3

Unit-1.0: Data communication Components 6 hrs
Representation of data and its flow Networks, Various Connection Topology, Protocols and Standards, OSI model, Transmission Media, LAN: Wired LAN, Wireless LANs, Connecting LAN and Virtual LAN.

Unit-2.0: Techniques for Bandwidth utilization 6 hrs
Techniques for Bandwidth utilization: Multiplexing - Frequency division, Time division and Wave division, Concepts on spread spectrum.

Unit-3.0: Data Link Layer and Medium Access Sub Layer 8 hrs
Error Detection and Error Correction - Fundamentals, Block coding, Hamming Distance, CRC; Flow Control and Error control protocols - Stop and Wait, Go back – N ARQ, Selective Repeat ARQ, Sliding Window, Piggybacking, Random Access, Multiple access protocols -Pure ALOHA, Slotted ALOHA, CSMA/CD,CDMA/CA

Unit-4.0 Network Layer 7 hrs
Switching, Logical addressing – IPV4, IPV6; Address mapping - ARP, RARP, BOOTP and DHCP–Delivery, Forwarding and Unicast Routing protocols.

Unit-5.0: Transport Layer 8 hrs
Process to Process Communication, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), SCTP Congestion Control; Quality of Service, QoS improving techniques: Leaky Bucket and Token Bucket algorithm.

Unit-6.0: Application Layer 7 hrs
Domain Name Space (DNS), DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls, Basic concepts of Cryptography.

Text/Reference:

1. Data Communication and Networking, 4th Edition, Behrouz A. Forouzan, McGraw-Hill.
2. Data and Computer Communication, 8th Edition, William Stallings, Pearson Prentice Hall India.
3. Computer Networks, 8th Edition, Andrew S. Tanenbaum, Pearson New International Edition.
4. Internetworking with TCP/IP, Volume 1, 6th Edition Douglas Comer, Prentice Hall of India.
5. TCP/IP Illustrated, Volume 1, W. Richard Stevens, Addison-Wesley, United States of America.

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Course Code- 105601 Compiler Design 3 0 0 3

Unit-1.0: 7 hrs

Introduction: Phases of compilation and overview.

Lexical Analysis (scanner): Regular languages, finite automata, regular expressions, from regular expressions to finite automata, scanner generator (lex, flex).

Unit-2.0: 9 hrs

Syntax Analysis (Parser): Context-free languages and grammars, push-down automata, LL(1) grammars and top-down parsing, operator grammars, LR(O), SLR(1), LR(1), LALR(1) grammars and bottom-up parsing, ambiguity and LR parsing, LALR(1) parser generator (yacc, bison).

Unit-3.0: 8 hrs

Semantic Analysis: Attribute grammars, syntax directed definition, evaluation and flow of attribute in a syntax tree.

Symbol Table: Its structure, symbol attributes and management. Run-time environment: Procedure activation, parameter passing, value return, memory allocation, and scope.

Unit-4.0: 7 hrs

Intermediate Code Generation: Translation of different language features, different types of intermediate forms.

Code Improvement (optimization) Analysis: control-flow, data-flow dependence etc.; Code improvement local optimization, global optimization, loop optimization and peep-hole optimization.

Unit-5.0: 4 hrs

Architecture dependent code improvement: instruction scheduling (for pipeline) and loop optimization (for cache memory). Register allocation and target code generation.

Unit-6.0: 7 hrs

Advanced topics: Type systems, data abstraction, compilation of Object Oriented features and non- imperative programming languages.

Text/Reference:

1. Compilers Principles Techniques And Tools by Alfred V. Aho, Ravi Sethi, Jeffery D. Ullman. Pearson Education.
2. Compiler Design by Santanu Chattopadhyay. PHI.
3. Modern Compiler Design by Dick Grune, E. Bal. Ceriel, J. H. Jacobs, and Koen G. Langendoen, Viley Dreamtech.

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Course Code- 105602 Machine Learning **3 1 0 4**

Unit-1.0 **8 hrs**

Introduction: Basic definitions, Linear Algebra, Statistical learning theory, types of learning, hypothesis space and Inductive bias, evaluation and cross validation, Optimization.

Unit-2.0 **8 hrs**

Statistical Decision Theory, Bayesian Learning (ML, MAP, Bayes estimates, Conjugate priors), Linear Regression, Ridge Regression, Lasso, Principal Component Analysis, Partial Least Squares

Unit-3.0 **9 hrs**

Linear Classification, Logistic Regression, Linear Discriminant Analysis, Quadratic Discriminant Analysis, Perceptron, Support Vector Machines + Kernels, Artificial Neural Networks + Back Propagation, Decision Trees, Bayes Optimal Classifier, Naive Bayes.

Unit-4.0 **5 hrs**

Hypothesis testing, Ensemble Methods, Bagging Adaboost Gradient Boosting.

Unit-5.0 **5 hrs**

Clustering, K-means, K-medoids, Density-based Hierarchical, Spectral.

Unit-6.0 **7 hrs**

Expectation Maximization, GMMs, Learning theory Intro to Reinforcement Learning, Bayesian Networks.

Text/Reference:

1. Machine Learning. Tom Mitchell. First Edition, McGraw- Hill, 1997
2. Introduction to Machine Learning Edition 2, by Ethem Alpaydin.
3. J. Shavlik and T. Dietterich (Ed), Readings in Machine Learning, Morgan Kaufmann, 1990.
4. P. Langley, Elements of Machine Learning, Morgan Kaufmann, 1995.
5. Understanding Machine Learning. Shai Shalev-Shwartz and Shai Ben-David. Cambridge University Press. 2017. [SS-2017]
6. The Elements of Statistical Learning. Trevor Hastie, Robert Tibshirani and Jerome Friedman. Second Edition. 2009. [TH-2009]

Program Elective-I

Course Code- 105603 Signals and Systems 3 0 0 3

Unit-1.0 **8 hrs**

Introduction to Signals and Systems: Signals and systems as seen in everyday life, and in various branches of engineering and science. Signal properties: periodicity, absolute integrability, determinism and stochastic character. Some special signals of importance: the unit step, the unit impulse, the sinusoid, the complex exponential, some special time-limited signals; continuous and discrete time signals, continuous and discrete amplitude signals. System properties: linearity, additivity and homogeneity, shift-invariance, causality, stability, realizability. Examples.

Unit-2.0 **8 hrs**

Behavior of continuous and discrete-time LTI systems: Impulse response and step response, convolution, input-output behavior with aperiodic convergent inputs, cascade interconnections. Characterization of causality and stability of LTI systems. System representation through differential equations and difference equations. State-space Representation of systems. State-Space Analysis, Multi-input, multi-output representation. State Transition Matrix and its Role. Periodic inputs to an LTI system, the notion of a frequency response and its relation to the impulse response.

Unit-3.0 **9 hrs**

Fourier Transforms: Fourier series representation of periodic signals, Waveform Symmetries, Calculation of Fourier Coefficients. Fourier Transform, convolution/multiplication and their effect in the frequency domain, magnitude and phase response, Fourier domain duality. The Discrete-Time Fourier Transform (DTFT) and the Discrete Fourier Transform (DFT), Parseval's Theorem.

Unit-4.0 **6 hrs**

Laplace and z- Transforms: Review of the Laplace Transform for continuous time signals and systems, system functions, poles and zeros of system functions and signals, Laplace domain analysis, solution to differential equations and system behavior. The z-Transform for discrete time signals and systems, system functions, poles and zeros of systems and sequences, z-domain analysis.

Unit-5.0 **6 hrs**

Sampling and Reconstruction: The Sampling Theorem and its implications Spectra of sampled signals. Reconstruction: ideal interpolator, zero-order hold, first-order hold. Aliasing and its effects, Relation between continuous and discrete time systems.

Unit-6.0 5 **hrs**

Introduction to the applications of signal and system theory: modulation for communication, filtering, feedback control systems

Text/Reference:

1. V. Oppenheim, A. S. Willsky and S. H. Nawab, "Signals and systems", Prentice Hall, India, 1997.
2. J. G. Proakis and D. G. Manolakis, "Digital Signal Processing: Principles, Algorithms,and Applications", Pearson, 2006.
3. H. P. Hsu, "Signals and systems", Schaum's series, McGraw Hill Education, 2010.
4. S. Haykin and B. V. Veen, "Signals and Systems", John Wiley and Sons, 2007.
   A. V. Oppenheim and R. W. Schafer, "Discrete-Time Signal Processing", Prentice Hall, 2009.
5. M. J. Robert "Fundamentals of Signals and Systems", McGraw Hill Education, 2007.
6. P. Lathi, "Linear Systems and Signals", Oxford University Press, 2009.

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Course Code- 105604 Graph Theory 3 0 0 3

Unit-1.0.0 **8 hrs**

Introduction: What is graph, Application of graphs, Finite and infinite graphs, incidence and degree, isolated Vertex pendant Vertex, and Null graph, paths and circuits, isomorphism, sub graphs, a puzzle with multicolored cubes, walks, paths, and circuits, Connected graphs, disconnected graphs and components, Euler graphs, Operations on graphs, More on Euler graphs, Hamiltonian paths and circuits, The Traveling Salesman problem.

Unit-2.0 **7 hrs**

Trees and Fundamental circuits: Trees, some properties of trees, pendant vertices in a tree, Distance and centers in a tree, Rooted and binary trees, On counting trees, Spanning trees, fundamental circuits, Finding all spanning trees of a Graph, Spanning trees in a Weighted graph.

Unit-3.0 **9 hrs**

Cut set, and cut vertices: Properties of a cut set, all cut sets in a graph, Fundamental circuits and cut sets, connectivity and separability, Network flows, 1-Isomorphism, 2-Isomorphism.

Planar and Dual Graphs: Combinatorial vs. Geometric Graphs, Planar graph, kuratowski's Two Graphs, Difference Representations of a planar graph, Detection of planarity, Geometric Dual, Combinatorial, Duel, More on criteria of planarity, Thickness and crossings.

Unit-4.0 **6 hrs**

Matrix Representation of Graphs: Incidence Matrix Sub matrices of A(G), Circuits Matrix, Fundamental Circuit Matrix and Rank of B, An application to a switching Network, Cut-set Matrix, Relationships among Af , Bf and Cf . path Matrix, Adjacency Matrix.

Unit-5.0 **5 hrs**

Coloring, Covering and partitioning: Chromatic number, Chromatic partitioning, Chromatics polynomial, Coverings, Four color problem.

Unit-6.0 **7 hrs**

Directed Graphs: What's a directed Graphs, Some types of Digraphs, Digraphs and binary Relations, Directed paths and connectedness, Euler Digraphs, Trees with Directed Edges, Fundamental Circuits in Digraphs, Matrices A, B and C of Digraphs, Adjacency Matrix of a Digraph, Paired Comparisons and Tournaments, Acyclic Digraphs and Decyelization.

Text/Reference:

1. Douglas B. West, "Introduction to Graph Theory", Prentice Hall of India.
2. Deo, N: Graph theory, PHI.
3. Bondy and Murthy: Graph theory and application. Addison Wesley.
4. R. Diestel, "Graph Theory", Springer-Verlag, 2nd edition, 2000.
5. John M. Aldous and Robin J. Wilson: Graphs and Applications-An Introductory Approach, Springer.
6. Robin J, Wilson: Introduction to Graph Theory, Addison Wesley.
7. Frank Harary, "Graph Theory", Narosa.
8. R. Ahuja, T. Magnanti, and J. Orlin, "Network Flows: Theory, Algorithms, and Applications", Prentice-Hall.

B.Tech (Computer Science & Engineering) **Semester - VI**

Course Code- 105606 Introduction to Java Programming Language 3 0 0 3

Unit-1.0 **10 hrs**

Introduction to Java: Feature to Java, Java Virtual Machine, Differences between C++ and Java, Part of Java, API Document, Starting a Java Program. Important Classes, Formatting the Output

Naming Conventions and Data Types: Naming Conventions in Java. Data types in Java, Literals.

Operators and Control Statements in Java: Arithmetic Operators, Unary Operators, Relational Operators, Logical Operators, Boolean Operators, Bitwise Operators, Ternary Operators, New Operator, Cast Operator, If … else statement, Switch statement, Break statement, Continue statement, Return statement, do … while loop, while loop, for loop.

Input and Output: Accepting Input from the keyboard, reading input in Java, Util, Scanner class, displaying output with System out print(), Displaying formatted output with string, Format.

Unit-2.0 **9 hrs**

Arrays and Strings: Types of Arrays, Array name, Length, Command Line Arguments, Creating Strings, String Class Methods, String Comparison, Immutability of Strings, Creating String Buffer Objects, String Buffer Class Methods, String Builder Class, String Builder Class Methods.

Wrapper Classes: Number class, Character class, Byte class, Short class, Integer class, Long class, Float class, Double class, Boolean class, Math class.

Introduction to OOPS: Problems in procedure oriented approach, Features of Object Oriented Programming System, Object creation, Initializing the instance variable, Constructors.

Unit-3.0 **9 hrs**

Methods of Java: Method Prototype, Method Body, Understanding Methods, Static Methods, Static Block, The keyword 'this', Instance Methods, Passing Primitive Data Types to Methods, Passing Objects to Methods, Passing Arrays to Methods, Recursion, Factory Methods.

Inheritance and Polymorphism: Inheritance, The Keyword 'super', The Protected Specified, Types of

Inheritance, Polymorphism with variables, Polymorphism using methods, Polymorphism with Static Methods, Polymorphism with Private Methods, Abstract Classes.

Packages: Package, Different types of Packages, Interface in a Package, Access Specifies in Java.

Unit-4.0 **4 hrs**

Exceptional handling: Errors in Java Program, Exceptions throws and throw clause, Types of exceptions, Re-throwing an exception.

Threads: Single and Multitasking, Creating and terminating the thread, Single and Multi-tasking using threads, Deadlock of threads, Thread communication.

Unit-5.0 **5 hrs**

Introduction to AWT and Applets: AWT components, Creating and closing the frame, Drawing in the frame, Displaying dots and text in the frame, Event Handling, Listeners and Listener methods, Creating and uses of Applets, An applet with swing components, Applet parameters.

Unit-6.0 **5 hrs**

Introduction on Java database connectivity: Database servers and clients, JDBC, Connecting to a Database, Stored Procedures and Callable Statement, Storing file and Image into database, retrieving a file and images from database, Types of JDBC drivers.

Text/Reference:

1. Core Java by R Nageswara & Kogent Solution Inc, Dreamtech.
2. The Complete Reference Java Tata McGraw Hill.
3. Java 6 Programming Black Book, w/CD by Kogent Solutions Inc,, Dreamtech .
4. Professional Java, JDK 6 Ed. by Richardson Avondolio Wrox.
5. Programming with Java by E Balagurusamy Tata McGraw Hill.

B.Tech (Computer Science & Engineering) **Semester - VI**

Course Code- 105607 Probability and Statistical Inference 3 0 0 3

Unit-1.0 **6 hrs**

Probability: Properties of Probability, Methods of Enumeration, Conditional Probability, Independent Events, Bayes' Theorem.

Unit-2.0 **7 hrs**

Discrete Distributions: Random Variables of the Discrete Type, Mathematical Expectation, Special Mathematical Expectations, the Binomial Distribution, the Negative Binomial Distribution, the Poisson distribution.

Unit-3.0 **6 hrs**

Continuous Distributions: Random Variables of the Continuous Type, the Exponential, Gamma, and Chi-Square Distributions, the Normal Distribution, Additional Models.

Unit-4.0 **6 hrs**

Bivariate Distributions: Bivariate Distributions of the Discrete Type, the Correlation Coefficient, Conditional Distributions, Bivariate Distributions of the Continuous Type, the Bivariate Normal Distribution.

Unit-5.0 **8 hrs**

Distributions of Functions of Random Variables: Functions of One Random Variable, Transformations of Two Random Variables, Several Random Variables, The Moment-Generating Function Technique, Random Functions Associated with Normal Distributions, The Central Limit Theorem, Approximations for Discrete Distributions, Chebyshev's Inequality and Convergence in Probability, Limiting Moment-Generating Functions.

Unit-6.0 **9 hrs**

Point Estimation: Descriptive Statistics, Exploratory Data Analysis, Order Statistics, Maximum Likelihood Estimation, A Simple Regression Problem, Asymptotic Distributions of Maximum Likelihood Estimators, Sufficient Statistics, Bayesian Estimation, More Bayesian Concepts.

Interval Estimation: Confidence Intervals for Means, Confidence Intervals for the Difference of Two Means, Confidence Intervals For Proportions, Sample Size, Distribution-Free Confidence Intervals for Percentiles, More Regression, Resampling Methods.

Text/Reference:

1. Probability and Statistical Inference", Robert V. Hogg, Elliot A. Tanis, Dale L. Zimmerman; Pearson Education, Inc. Ninth Edition-2015.
2. "Statistical Inference", M. Rajagopalan, P. Dhanavanthan, PHI Learning – 2012
3. "Probability Distribution Theory and Statistical Inference", Kartick Chandra Bhuyan, NCBA Publication - 2010.

B.Tech (Computer Science & Engineering) **Semester - VI**

Course Code-105608 Numerical Methods 3 0 0 3

Unit-1.0 **9 hrs**

Error in numerical calculations: Sources of errors, significant digits and numerical instability. Solutions of non-linear equations: Bisection method, Method of false position, Newton-Raphson method, Fixed-point iteration, Rates of convergence of these methods. Iteration based on second degree equation: Muller method, Chebyshev method, Graeffe's root squaring method for polynomials, Bairstow's method for extracting quadratic factor in the case of polynomial equations.

Unit-2.0 **6 hrs**

Solution of system of linear algebraic equations: Direct methods: Gauss and Gauss–Jordan methods. Crout's triangularization method. Iterative methods: Gauss-Jacobi and Gausss-Seidel methods, Relaxation method, Newton's method for nonlinear simultaneous equations, Power method for determination eigen values, convergence of Power method.

Unit-3.0: **5 hrs**

Polynomial Interpolation: Lagrange's interpolation, Newton's divided difference interpolation polynomial, Gregory-Newton Forward and Back ward difference interpolation formulae, Piecewise and Spline interpolation.

Unit-4.0: **6 hrs**

Numerical Differentiation: Differentiation formulas in the case of equally spaced points. Numerical integration: Trapezoidal and Simpson rules, Gaussian integration, Errors of integration formulas.

Unit-5.0 **8 hrs**

Numerical solution of ordinary differential equations: Single step methods: Taylor series method, Picard's Method, Euler and Modified Euler methods, Runge – Kutta methods of 2nd and 4th order. Multi-step methods: Miline's PredictorCorrector formulas, Adam-Bashforth and Adam-Moulton formulas.

Unit-6.0 **8 hrs**

Boundary value problems: Solution of Linear difference equations with constant coefficients, Solutions of boundary value problems in ordinary differential equations, Approximate solution of eigen value problems, Finite difference methods for solving two dimensional Laplace's equation for a rectangular region, Finite difference method of solving heat equation and wave equation with given initial and boundary conditions.

Text/Reference:

1. Froberg C. E., Introduction to Numerical Analysis 2nd edition, Addison Wesley, 1970.
2. Gerald C. F., Wheatley P.O., Applied Numerical Analysis, 6th edition, Pearson Asia,2002.
3. Jain M.K., Iyengar S. R. K., Numerical methods for Scientific and Engineering Computation, 3rd edition, New Age International (P) Ltd, 1996.
4. Phillips G.M., Taylor P.J., Theory and Applications of Numerical Analysis, 2nd edition Academic Press, 1996.

B.Tech (Computer Science & Engineering) **Semester - VI**

Course Code- 105609 Information Theory and Coding 3 0 0 3

Unit-1.0 **8 hrs**

Information Theory: Introduction, measure of Information, Mutual information, Joint and conditional Entropy. Coding Theory**:** Classification of codes, Kraft McMillan inequality, Source coding theorem, Shannon-Fano coding, Huffman coding, Mutual information - Discrete memoryless channels.

Unit-2.0 **5 hrs**

Channel capacity, Channel coding theorem, Differential entropy and mutual Information for continuous ensembles, Information Capacity theorem,

Unit-3.0 **7 hrs**

Linear Block Codes: Syndrome and error detection, Error detection and correction capability, Standard array and syndrome decoding, Encoding and decoding circuit, Single parity check codes, Repetition codes and dual codes, Hamming code, Golay Code.

Unit-4.0 **8 hrs**

Galois field, Primitive element & Primitive polynomial, Minimal polynomial and generator polynomial, Description of Cyclic Codes, Generator matrix for systematic cyclic code, Encoding for cyclic code, Syndrome decoding of cyclic codes

Unit-5.0 **7 hrs**

Binary BCH code, Generator polynomial for BCH code, Decoding of BCH code, RS codes, generator polynomial for RS code, Decoding of RS codes, Cyclic Hamming code and Golay code, CRC code

Unit-6.0 **7 hrs**

Introduction of convolution code, State diagram, Polynomial description of convolution code, Generator matrix of convolution code, Tree diagram, Trellis diagram, Sequential decoding and Viterbi decoding, Known good convolution code.

Text/Reference:

1. Ranjan Bose, “Information Theory coding and Cryptography”, McGraw-Hill Publication
2. J C Moreira, P G Farrell, “Essentials of Error-Control Coding”, Wiley Student Edition
3. BernadSklar, “Digital Communication Fundamentals & applications”, Pearson Education. Second Edition.
4. Simon Haykin, “Communication Systems”, John Wiley & Sons, Fourth Edition.
5. Shu lin and Daniel j, Cistellojr., “Error control Coding” Pearson, 2nd Edition.
6. Todd Moon, “Error Correction Coding : Mathematical Methods and Algorithms”, Wiley Publication
7. Khalid Sayood, “Introduction to Data compression”, Morgan Kaufmann Publishers

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Course Code- 105610 Soft Computing 3 0 0 3

Unit-1.0 **8 hrs**

Introduction to Soft Computing: Evolution of Computing: Soft Computing Constituents, Soft vs Hard Computing, From Conventional AI to Computational Intelligence: Machine Learning Basics.

Unit-2.0 **6 hrs**

Neural Networks: Machine Learning Using Neural Network, Adaptive Networks, Feed forward Networks, Supervised Learning Neural Networks,

Unit-3.0 **6 hrs**

Radial Basis Function Networks: Reinforcement Learning, Unsupervised Learning Neural Networks, Adaptive Resonance architectures, Advances in Neural networks.

Unit-4.0 **8 hrs**

Fuzzy Systems: Fuzzy Sets, Operations on Fuzzy Sets, Fuzzy Relations, Membership Functions: Fuzzy Rules and Fuzzy Reasoning, Fuzzy Inference Systems, Fuzzy Expert Systems, Fuzzy Decision Making, Fuzzy based Back Propagation network.

Unit-5.0 **7 hrs**

Genetic Algorithm: Introduction to Genetic Algorithms (GA), Applications of GA in Machine Learning: Machine Learning Approach to Knowledge Acquisition, GA based Back P.

Unit-6.0 **7 hrs**

Matlab/Python Lib: Introduction to Matlab/Python, Arrays and array operations, Functions and Files, Study of neural network toolbox and fuzzy logic toolbox, Simple implementation of Artificial Neural Network and Fuzzy Logic.

Text/Reference:

1. Principles Of Soft Computing, 2nd Ed (With CD) Book by S. N. Deepa and S. N. Sivanandam
2. Soft Computing, D. K. Pratihar, Narosa, 2008.
3. Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis & Applications, S.Rajasekaran, G. A. Vijayalakshami, PHI.
4. Genetic Algorithms: Search and Optimization, E. Goldberg.
5. Neuro-Fuzzy Systems, Chin Teng Lin, C. S. George Lee, PHI
6. Build Neural Network With MS Excel sample by Joe choong.

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Course Code- 105611 Distributed Database 3 0 0 3

Unit-1.0 **7 hrs**

Concept And Overview Distributed Database System: What is Distributed Database System (DDBS), Features of DDBS, promises of DDBS, Design issue in DDBS, Distributed DBMS architecture:- Client/server System, Peer-to-Peer, Multi-Database system.

Unit-2.0 **7 hrs**

Distributed Database Design: Distributed database design concept, objective of Data Distribution, Data Fragmentation, The allocation of fragment, Transparencies in Distributed Database Design.

Unit-3.0 **7 hrs**

Distributed Transaction And Concurrency Control: Basic concept of Transaction management, objective Distributed transaction management, Model for Transaction management Distributed Concurrency control:- Objective, concurrency control anomalies, Distributed Serializability, Locking based algorithm.

Unit-4.0 **7 hrs**

Distributed Deadlock and Recovery: Introduction to Deadlock, Distributed Deadlock prevention, avoidance, detection and recovery, Two-Phase and Three-Phase Commit Protocol.

Unit-5.0 **6 hrs**

Distributed Query Processing And Optimization: Concepts, objective, and phases of distributed query processing; join strategies in fragment relation, Global query optimization

Unit-6.0 **8 hrs**

Heterogeneous Database: Architecture of Heterogeneous Database, Database Integration: Schema Translation and schema Integration, Query processing issues in Heterogeneous database.

XML: XML for data integration, structure of XML, XML document schema, Querying and Transformation, storage of XML data, XML application.

Text/Reference:

1. Silberschatz A, KorthHF, Sudarshan S, Database System Concepts, McGrall Hill.
2. Ceri S, Pelagatti G, Distributed Databases – Principles and Systems, McGraw Hill.

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Program Elective-II

Course Code- 105612 Advanced Data Structures and Algorithms 3 0 0 3

Unit-1.0 **6 hrs**

Basic Algorithms: Asymptotic Notation, Recursion, Divide-and-Conquer Paradigm, Basic Data Structures; Possibly Fast Fourier Transform.

Unit-2.0 **8 hrs**

Sorting: Merge Sort, Bucket And Radix Sort; Medians and Order Statistics.

Unit-3.0 **8 hrs**

Data Structures: Priority Queues And Heaps, Dictionaries, Hash Tables, Bloom Filters, Binary Search Trees, Interval Trees. Union-Find, Range Trees, Fractional Cascading.

Unit-4.0 **8 hrs**

Algorithmic techniques: Divide-and-conquer, Dynamic Programming, Greedy Algorithms. Data Compression: Huffman's coding, BWT, LZW

Unit-5.0 **8 hrs**

Network Flow, String Algorithms, Suffix Trees, Geometric Algorithms, Linear Programming, Polynomial and the FFT.

Unit-6.0 **4 hrs**

Complexity classes and NP

Text/Reference:

1. Introduction to algorithms: Cormen, Leiserson, Rivest and Stein.
2. Algorithm Design, Jon Kleinberg and Eva Tardos, Pearson, ISBN-13: 978-0321295354.
3. Algorithms (4th Edition) by Robert Sedgewick and Kevin Wayne, ISBN-13: 978-0321573513.
4. The Algorithm Design Manual: Steven Skiena.
5. Algorithm Design: Kleinberg and Tardos.

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Course Code- 105613 Advance Java Programming Language 3 0 0 3

Unit-1.0 **8 hrs**

Java Beans and Web Servers: Introduction to Java Beans, Advantage, Properties, BDK, Introduction to EJB, Java Beans API Introduction to Servelets, Lifecycle, JSDK, Servlet API, Servlet Packages: HTTP package, Working with Http request and response, Security Issues. Java Script: Data types, variables, operators, conditional statements, array object, date object, string object, Dynamic Positioning and front end validation, Event Handling.

Unit-2.0 **8 hrs**

JSP: Introduction to JSP, JSP processing, JSP Application Design, Tomcat Server, Implicit JSP objects, Conditional Processing, Declaring variables and methods, Error Handling and Debugging, Sharing data between JSP pages- Sharing Session and Application Data.

Unit-3.0 **8 hrs**

Database Connectivity: Database Programming using JDBC, Studying Javax.sql.*package, accessing a database from a JSP page, Application-specific Database Action, Developing Java Beans in a JSP page, introduction to Struts framework.

Unit-4.0 **8 hrs**

Java Servlet: Brief origin and advantages over CGI, J2EE Servlet 2.x Specification, Writing small Servlet Programs, Deployment Descriptor, Inter Servlet Collaboration, Session: Definition, State on web, Different ways to track sessions.

Unit-5.0 **6 hrs**

J2SE: Concepts and Prerequisites: Data Types, Arrays, Dynamic Arrays, Type Casting, Classes and Objects, Inheritance, Interfaces, Exception Handling, Multi-Threading.

Unit-6.0 **4 hrs**

J2EE Architecture: J2EE as a framework, Client Server Traditional model, Comparison amongst 2-tier, 3-tier and N-tier architectures, Thin and Thick Clients.

Text/Reference:

1. Elliotte Rusty Harold, " Java Network Programming", O'Reilly publishers,
2. Ed Roman, "Mastering Enterprise Java Beans", John Wiley & Sons Inc.
3. Hortsmann& Cornell, "Core Java 2 Advanced Features, Vol II", Pearson Education,
4. Web reference: http://java.sun.com.
5. Patrick Naughton, "COMPLETE REFERENCE: JAVA2", Tata McGraw-Hill.

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Course Code- 105614 Web and Internet Technology 3 0 0 3

Unit-1.0 **6 hrs**

Web Basics: Introduction, Concept of Internet- History of Internet, Protocols of Internet, World Wide Web, URL, Web Server, Web Browser. Recent Web technologies - A case study on WWW, web 2.0 etc., Client/Server Computing: C/S Computing, Middleware, Fat client VS Fat Servers, N-tiered Software Architecture; Markup-language: Markup Languages and their grammars - SGML, DTD Resources, HTML, CSS, XML, XSL, Query Languages for XML.

Unit-2.0 **7 hrs**

HTML: Introduction, History of HTML, Structure of HTML Document: Text Basics, Structure of HTML Document: Images and Multimedia, Links and webs, Document Layout, Cascading Style Sheet- HTML 4 style sheet features, Creating Forms, Frames and Tables.
Dynamic HTML: Introduction of DHTML- HTML vs. DHTML, Advantages of DHTML, CSS of DHTML, Event Handling, Data Binding, Browser Object Models.

Unit-3.0 **7 hrs**

XML Introduction and programming: Introduction of XML- Some current applications of XML, Features of XML, Anatomy of XML document, The XML Declaration, Element Tags- Nesting and structure, XML text and text formatting element, Table element, Mark-up Element and Attributes, Document Type Definition (DTD), types. XML Programming- XML Objects, Checking Validity, Understanding XLinks, XPointer, Event-driven Programming, XML Scripting.

Unit-4.0 **8 hrs**

XML Presentation Technology & XML Processor: Introduction, XML with Style Sheet Technologies- Concept of XSL, XML Schema, Importance of XML schema, Creating Element in XML Schema, XML Schema Types, Introduction of XML Processor- Components of XML processor, Concept of DOM and SAX, Introduction of Java Script, JavaScript characteristics, Objects in Java Script, Dynamic HTML with Java Script
XML Http Request: Introduction, XML Http Request, The XML Http Request Object, Events for the XML Http Request Object, Request Object for XML Http Request, Response Object for XML Http Request.

Unit-5.0 **7 hrs**

AJAX Introduction: Introduction, AJAX Introduction, AJAX Components, Handling Dynamic HTML with Ajax, CSS to Define Look and Feel, Understand the XML Mark-up, XMLHttpRequest.
AJAX using XML and XML Http Request: Introduction, Ajax Using XML and XML Http Request, Accessing, Creating and Modifying XML Nodes, Loading XML Data into an HTML Page, Receiving XML Responses, Handling Response XML.

Unit-6.0 **7 hrs**

PHP Introduction & AJAX with Database: PHP Introduction, Structure of PHP, PHP Functions, AJAX with PHP, PHP Code and the Complete AJAX Example, AJAX Database, Working of AJAX with PHP, Ajax PHP Database Form, AJAX PHP MySQL Select Query.

Active Server Page & ASP Database Connectivity : Introduction, Introduction of ASP, ASP – Variables, ASP Control Structure, ASP Objects' Properties and Methods, ASP Components, ASP Database Connection, ASP Scripting Components.

Text/Reference:

1. Jeffrey C. Jackson, "Web Technologies: A computer science perspective", Pearson Education
2. Developing Web Applications, Ralph Moseley and M. T. Savaliya, Wiley-India
3. Web Technologies, Black Book, dreamtech Press
4. Web Design, Joel Sklar, Cengage Learning
5. Developing Web Applications in PHP and AJAX, Harwani, McGrawHill
6. Eric T. Freeman, Elisabeth Robson, "Head First JavaScript Programming", O'Reilly Media
7. L. Beighley, Michael Morrison, "Head First PHP & MySQL", O-Reilly Media
8. B. Basham, Kathy Sierra, Bert Bates, "Head First Servlets and JSP", O'Reilly publication.
9. R. M. Riordan, "Head First Ajax", O'Reilly Media.
10. Web Design with HTML, CSS, JavaScript and Query Set by Jon Duckett.

B.Tech (Computer Science & Engineering) **Semester - VI**

Course Code- 105615 Multimedia Technology and its Applications 3 0 0 3

Unit-1.0: Introduction to Multimedia System 6 hrs

Architecture and components, Multimedia distributed processing model, Synchronization, Orchestration and Quality of Service (QOS) architecture.

Unit-2.0: Audio and Speech 8 hrs

Data acquisition, Sampling and Quantization, Human Speech production mechanism, Digital model of speech production, Analysis and synthesis, Psycho-acoustics, low bit rate speech compression, MPEG audio compression.

Unit-3.0: Images and Video 8 hrs

Image acquisition and representation, Composite video signal NTSC, PAL and SECAM video standards, Bi-level image compression standards: ITU (formerly CCITT) Group III and IV standards, JPEG image compression standards, MPEG video compression standards.

Unit-4.0: Multimedia Communication 6 hrs

Fundamentals of data communication and networking, Bandwidth requirements of different media, Real time constraints: Audio latency, Video data rate, multimedia over LAN and WAN, Multimedia conferencing, Multimedia devices.

Unit-5.0: Hypermedia presentation 6 hrs

Authoring and Publishing, Linear and non-linear presentation, Structuring Information, Different approaches of authoring hypermedia documents, Hyper-media data models and standards.

Unit-6.0: Multimedia Information Systems 8 hrs

Operating system support for continuous media applications: limitations is usual OS, New OS support, Media stream protocol, file system support for continuous media, data models for multimedia and hypermedia information, content based retrieval of unstructured data.

Text/Reference:

1. Handbook of Multimedia Computing, Borivoje Furht
2. Multimedia Systems, Standards, and Networks, A. Puri and T. Chen, Marcel Dekker
3. Multimedia : Computing Communications & Applications, Ralf Steinmetz, Klara Nahrstedtm
4. Multimedia Systems, Ralf Steinmetz and Klara Nahrstedt
5. Multimedia Communications: Directions and Innovations, J. D. Gibson
6. Introduction to Data Compression, Morgan-Kaufmann, K. Sayood
7. H.264 and MPEG-4 Video Compression, Iain E.G. Richardson
8. Multimedia Literacy by Fred Hoffsteller, McGraw Hill.

B.Tech (Computer Science & Engineering) **Semester - VI**

Course Code- 105616 Cryptography and Network Security 3 0 0 3

Unit-1.0 **7 hrs**

Security Services, Mechanisms and Attacks, TheOSI Security Architecture, A Model for Network Security. Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Rotol Machines, Steganography.

Unit-2.0 **7 hrs**

Simplified DES, Block Cipher Principles, The Data Encryption Standard, The Strength of DES, Differential and Linear Cryptanalysis, Block Cipher Design Principles, Block Cipher Modes of Operation.

Unit-3.0 **7 hrs**

Finite Fields and Confidentiality: Groups, Rings, and Fields, Modular Arithmetic, Euclid's Algorithm, Finite Fields of the Form GF (p), Polynomial arithmetic, Finite Fields of the Form GF(2"), Placement of Encryption Function, Traffic Confidentially, Key Distribution, Random Number Generation.

Unit-4.0 **7 hrs**

Encryption Standard and Ciphers: Evaluation criteria for AES, AES cipher, Multiple encryption and Triple DES, Block cipher Modes of operation, Stream ciphers and RCG.

Unit-5.0 **7 hrs**

Number Theory and Public-Key Cryptography: Prime Numbers, Fermat's and Euler's Theorems, Testing for Primality, The Chinese Remainder Theorem, Discrete Logarithms, Principles of Public-Key Cryptosystems, The RSA Algorithm,

Unit-6.0 **7 hrs**

Message Authentication, Function, Algorithms and Digital System: Authentication Requirements, Authentication Functions, Message Authentication Codes, Hash Functions, Security of Hash Functions and MACs, Secure Hash Algorithm, HMAC, Digital Signatures, Authentication Protocols.

Text/Reference:

1. W.Stallings : Cryptography and Network Security : Principles and Practice, 4/e Pearson Education, New Delhi, 2006.
2. B.A. Forouzan – Cryptography and Network Security, TMH, New Delhi, 2007
3. B. Schneier – Applied Cryptography, John Wiley, Indian Edition, 2006.

B.Tech (Computer Science & Engineering) **Semester - VI**

Course Code- 105617 Mobile and Wireless Computing 3 0 0 3

Unit-1.0 **9 hrs**

Introduction to Wireless Networks: Applications, History, Simplified Reference Model, Wireless transmission, Frequencies, Signals, Antennas, Signal propagation, Multiplexing, Modulation, Spread spectrum, Cellular Systems.

Unit-2.0 **5 hrs**

MAC: Motivation, SDMA, FDMA, TDMA, CDMA,

Unit-3.0 **5 hrs**

Telecommunication Systems: GSM, DECT, TETRA. UMTS, MT-2000.

Unit-4.0 **9 hrs**

Wireless LAN, Infrared Vs Radio transmission, Infrastructure, Adhoc Network, 802.11, HIPERLAN, Bluetooth, Mobile Network Layer, Mobile IP, Dynamic Host Configuration Protocol.

Unit-5.0 **9 hrs**

Adhoc Networks, Mobile Transport Layer, Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit / Fast recovery, Transmission / Time-out freezing, Selective retransmission, Transaction Oriented TCP.

Unit-6.0 **5 hrs**

Support for Mobility, File Systems, WWW, Wireless Application Protocol.

Text/Reference:

1. Jochen Schiller, “Mobile Communications”, Pearson Education, Asia Publications, 2000.
2. William Stallings, “Wireless Communication and Networks”, PHI/Pearson Education, 2002.
3. Kaveh Pahlavan, Prasanth Krishnamoorthy, “Principles of Wireless Networks”, PHI/Pearson Education, 2003.
4. Hazyszt of Wesolowshi, “Mobile Communication Systems”, John Wiley and Sons Ltd, 2002.

B.Tech (Computer Science & Engineering) **Semester - VI**

Course Code- 100610 Computer Graphics 3 0 0 3

Unit-1.0.0 **8 hrs**

Introduction and Line Generation: Types of computer graphics, Graphic Displays- Random scan displays, Raster scan displays, Frame buffer and video controller. RGB color model, direct coding, lookup table; storage tube graphics display, Raster scan display, 3D viewing devices, Plotters, printers, digitizers, Light pens etc.; Active & Passive graphics devices; Computer graphics software.

Unit-2.0 **9 hrs**

Points and lines, Line drawing algorithms; DDA algorithm, Bresenham's line algorithm, Circle generating algorithms, Mid-point circle generating algorithm, and parallel version of these algorithms. Ellipse generating algorithm; scan line polygon, fill algorithm, boundary fill algorithm, flood fill algorithm. Transformations: Basic transformation, Matrix representations and homogenous coordinates, Composite transformations, Reflections and shearing.

Unit-3.0 **9 hrs**

Windowing and Clipping: Viewing pipeline, Viewing transformations, 2-D Clipping algorithms- Line clipping algorithms such as Cohen Sutherland line clipping algorithm, Liang Barsky algorithm, Line clipping against non-rectangular clip windows; Polygon clipping – Sutherland Hodgeman polygon clipping, Weiler and Atherton polygon clipping, Curve clipping, Text clipping

Unit-4.0 **4 hrs**

Three Dimensional: 3-D Geometric Primitives, 3-D Object representation, 3-D Transformation, 3-D viewing, projections, 3-D Clipping.

Unit-5.0 **6 hrs**

Curves and Surfaces: Quadric surfaces, Spheres, Ellipsoid, Blobby objects, introductory concepts of Spline, Bspline and Bezier curves and surfaces.

Unit-6.0 **6 hrs**

Hidden Lines and Surfaces: Back Face Detection algorithm, Depth buffer method, A- buffer method, Scan line method, basic illumination models– Ambient light, Diffuse reflection, Specular reflection and Phong model, Combined approach, Warn model, Intensity Attenuation, Color consideration, Transparency and Shadows.

Text/Reference:

1. Donald Hearn and M Pauline Baker, "Computer Graphics C Version", Pearson Education.
2. Foley, Vandam, Feiner, Hughes – "Computer Graphics principle", Pearson Education.
3. Rogers, " Procedural Elements of Computer Graphics", McGraw Hill.
4. Donald Hearn and M Pauline Baker, "Computer Graphics with OpenGL", Pearson education.

B.Tech (Computer Science & Engineering) **Semester - VI**

Course Code- 105601P **Complier Design Lab** **0 0 4 2**

Hands-on experiments related to the course contents of compiler design theory.

B.Tech (Computer Science & Engineering) **Semester - VI**

Course Code- 100601P **Computer Networks Lab** **0 0 4 2**

Hands-on experiments related to the course contents of Computer networks theory.

B.Tech (Computer Science & Engineering) **Semester - VI**

Course Code-105620P **Python Programming Lab** **0 0 2 1**

Perform any 10 Experiments

List of Experiments-

S.No.	Name of program
Input and Output	
1	Write a program to demonstrate different number data types in Python.
2	Write a program to perform different Arithmetic Operations on numbers in Python.
3	Write a program to create, concatenate and print a string and accessing sub-string from a given string.
4	Create a variable "number" and assign an Integer to the number. Check the assigned Integer is "Positive" or "Negative".
5	Write a program to find the largest element among three Numbers.
6	Write a program to print the sum of all the even numbers in the range 1 - 50 and print the even sum.
7	Write a Program to display all prime numbers within an interval of 20 and 50.
Variables and Functions	
8	Write a program to swap two numbers without using a temporary variable.
9	Write a program to define a function with multiple return values.
10	Write a python program to find factorial of a number using Recursion.
11	Write a python script to print the current date in the following format "WED 09 02:26:23 IST 2020".
12	Write a Python program to convert temperatures to and from Celsius, Fahrenheit [Formula: c/5 = f-32/9].
13	Write a Python script that prints prime numbers less than 20.
Loops and Conditionals	
14	Write a program to print the following patterns using loop: * ** *** ****
15	Write a program to print multiplication tables of 8, 15, 69.
16	Write a program to check whether the given input is digit or lowercase character or uppercase character or a special character (use 'if-else-if' ladder).
17	Write a python Program to print the Fibonacci sequence using while loop.
Strings	
18	Write a program to find the length of the string without using any library functions.
19	Write a program to check if two strings are anagrams or not.
20	Write a program to check if the substring is present in a given string or not. (use regular expressions)
Lists	
21	Write a program to perform the given operations on a list: i. add ii. Insert iii. slicing
22	Write a program to perform any 5 built-in functions by taking any list.
23	Write a program to get a list of the even numbers from a given list of numbers.(use only comprehensions).
24	Write a program to implement round robin.
	Note: This routine to take a variable number of sequences and return elements from them in round robin till each sequence is exhausted. If one of the input sequences is infinite, this is also infinite. e.g. if input is [1,2,3], (4,5) -> yield 1,4,2,5,3 one after the other. Use exception control and comprehensions to write elegant code. Hint:

	This requires you to understand variable arguments, lists, list copy, comprehensions, iterators, generators, exception handling, control flow etc.
Tuples	
25	Write a program to create tuples (name, age, address, college) for at least two members and concatenate the tuples and print the concatenated tuples.
26	Write a program to return the top 'n' most frequently occurring chars and their respective counts. e.g. aaaaabbbbcccc, 2 should return [(a 5) (b 4)]
Sets	
27	Write a program to count the number of vowels in a string (No control flow allowed).
28	Write a program that displays which letters are present in both strings.
29	Write a program to sort given list of strings in the order of their vowel counts.
Dictionaries	
30	Write a program to generate a dictionary that contains numbers (between 1 and n) in the form of (x, x*x).
31	Write a program to check if a given key exists in a dictionary or not.
32	Write a program to add a new key-value pair to an existing dictionary.
33	Write a program to sum all the items in a given dictionary.
Files	
34	Write a program to sort words in a file and put them in another file. The output file should have only lower case words, so any upper case words from source must be lowered. (Handle exceptions)
35	Write a program to find the most frequent words in a text. (read from a text file).

Additional Programs:

1. Write a program to check whether a given number has an even number of 1's in its binary representation (No control flow allowed).
2. Write a program to implement user defined map() function.
3. Write a program to return a list in which duplicates are removed and the items are sorted from a given input list of strings.
4. Write a program to implement left binary search.
5. Write a program to change days to hours, hours to minutes and minutes to seconds using currying of composition of functions.
6. Write a program to generate an infinite number of even numbers (Use generator)
7. Write a program to convert a given iterable into a list. (Using iterator)
8. Write a program that accepts a sequence of whitespace separated words as input and prints the words after removing all duplicate words and sorting them alphanumerically.