R.K.D.F. UNIVERSITY, BHOPAL
B.TECH (Computer Science and Engineering)
SECOND YEAR-Semester – III
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (CSE)	Engineering Mathematics-III	CS-3011	3L-1T-0P	4

Course Outcomes:

CO1 Analyze and solve engineering problems using Laplace Series.

CO2 Analyze and solve engineering problems using Fourier Series.

CO3 To apply partial differential techniques to solve the physical engineering problems.

CO4 Develop problem-solving techniques needed to accurately calculate probabilities. Apply problem-solving techniques to solving real-world events.

Course Contents:

UNIT I

Fourier series: Introduction of Fourier series, Fourier series for Discontinuous functions, and Fourier series for even and odd function. Laplace Transform: Introduction of Laplace Transform, Laplace Transform of elementary functions, properties of Laplace Transform, Change of scale property, second shifting property, Laplace transform of the derivative, Inverse Laplace transform & its properties, Convolution theorem, Applications of L.T. to solve the ordinary differential equations.

UNIT II

Difference Operators, Interpolation (Newton Forward & Backward Formulae, Central Interpolation Formulae, Lagrange's and divided difference formulae), Numerical Differentiation and Numerical Integration.

UNIT III

Errors & Approximations, Solution of Algebraic & Trancedental Equations (Regula Falsi, Newton-Raphson, Iterative, Secant Method), Solution of simultaneous linear equations by Gauss Elimination, Gauss Jordan, Crout's methods , Jacobi's and Gauss-Siedel Iterative methods.

UNIT IV

Solution of Ordinary Differential Equations (Taylor's Series, Picard's Method, Modified Euler's Method, Runge-Kutta Method, Milne's Predictor & Corrector method), Correlation and Regression, Curve Fitting (Method of Least Square).

UNIT V

Concept of Probability: Probability: Binomial, Poisson's, Continuous Distribution: Normal Distribution, Testing of Hypothesis: Students t-test, Fisher's z-test, Chi-Square Method.

References

1. Higher Engineering Mathematics, by BS Grewal, Khanna Publication
2. Advance Engineering Mathematics, by Dean G. Guffy, CRC Press
3. Advance Engineering Mathematics, by Erwin Kreyszig, John Wiley & Sons Inc.
4. Mathematics for Engineers by S. Arumungam, SCITECH Publication
5. Engineering Mathematics by SS Sastri, PHI Learning Pvt. Ltd.
6. Numerical Methods for Scientific and Engineering Computation by MK Jain, Iyengar and RK Jain, New Age International Publication
7. Probability and Statistics by Ravichandran, Wiley India
8. Mathematical Statistics by George R., Springer

R.K.D.F. UNIVERSITY, BHOPAL
B.TECH (Computer Science and Engineering)
SECOND YEAR, Semester – III
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (CSE)	Data structure and Algorithms	CS-3021	3L-1T-2P	6

Course Outcomes:

CO1 Understand the concept of Dynamic memory management, data types, algorithms, Big O notation.

CO2 Understand basic data structures such as arrays, linked lists, stacks and queues.

CO3 Describe the hash function and concepts of collision and its resolution methods

CO4 Solve problem involving graphs, trees and heaps.

CO5 Apply Algorithm for solving problems like sorting, searching, insertion and deletion of data

Course Contents:

UNIT I

Introduction: to Notions of data type, abstract data type, and data structures. Relation to the notion of classes and objects in object oriented programming. Importance of algorithms and data structures in programming. Notion of Complexity covering time complexity and space complexity. Worst case complexity, Average case complexity. Big O Notation. Examples of simple algorithms and illustration of their complexity. Introduction to recurrence relations. Iteration and Recursion - Problem solving using iteration and recursion with examples such as binary search, Fibonacci numbers, and Hanoi towers. Tradeoffs between iteration and recursion.

UNIT- II

List ADT. Implementation of lists using arrays and pointers. Stack ADT. Queue ADT. Implementation of stacks and queues. Dictionaries, Hash tables: open tables and closed tables. Analysis of hashing. Skip lists and analysis.

UNIT- III

Binary Trees - Definition and traversals: preorder, postorder, inorder, Common types and properties of binary trees, Counting of binary trees, Huffman coding using binary trees, Binary search trees: worst case analysis and average case analysis, AVL trees, Red-Black Trees, Splay trees, Priority Queues - Binary heaps: insert and delete min operations and analysis, Binomial queues.

UNIT- IV

Directed Graphs - Data structures for graph representation, Shortest path algorithms: Dijkstra (greedy algorithm) and Bellman-Ford (dynamic programming), Depth- first search and Breadth-first search.

Directed acyclic graphs, Undirected Graphs - Depth-first search and breadth-first search, Minimal spanning trees and algorithms (Floyd and Kruskal) and implementation, Application to the travelling salesman problem

UNIT- V

Sorting - Bubblesort, selection sort, insertion sort, Shell sort; Quicksort; Heapsort; Mergesort; Radix sort; Analysis of the sorting methods. Selecting the top k elements. Lower bound on sorting

References:

1. Classic Data Structures, by Debasis Sumanta, PHI Learning Private Limited
2. Data Structures and Algorithms, by Alfred V. Aho, Jeffrey D. Ullman and John E. Hopcroft, Addison- Wesley Series
3. Schaum's Outline of Data Structures, by Seymour Lipschutz, Tata McGraw Hill Education
4. Data Structures And Algorithms Made Easy, by Narasimha Karumanchi, Careermonk Publications
5. Data Structures and Algorithms in Python, by Michael T. Goodrich, Roberto Tamassia, and Michael H. Goldwasser, Wiley
6. Fundamentals of Data Structures in C, 2e, by Sahni Horowitz, University Press
7. Data Structures Through C in Depth, by S.K.Srivastava and Deepali Srivastava, BPB Publications
8. Data Structures and Algorithms, by Reema Thareja, Oxford University Press
9. Data Structures Using C, by E. Balagurusamy, McGraw Hill Education
10. Data Structures, 2e, by R. Venkatesan and S. Lovelyn Rose, Wiley
11. Data Structures Through C, by Yashavant Kanetkar, BPB Publications

R.K.D.F. UNIVERSITY, BHOPAL
B.TECH (Computer Science and Engineering)
SECOND YEAR, Semester – III
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (CSE)	Computer Organization and Architecture	CS-3031	3L-1T-0P	4

Course Outcomes:

CO1 Explain the organization of basic computer, its design and the design of control unit.

CO2 Understand basic data structures such as arrays, linked lists, stacks and queues.

CO3 Describe the operations and language of the register transfer, micro operations and input-output organization.

CO4 Understand the organization of memory and memory management hardware.

CO5 Elaborate advanced concepts of computer architecture, Parallel Processing, interprocessor communication and synchronization.

Course Contents:

UNIT I

Basic Structure of Computers

Functional units - Basic operational concepts - Bus structures - Software performance – Memory locations and addresses – Memory operations – Instruction and instruction sequencing – Addressing modes – Assembly language – Basic I/O operations – Stacks and queues.

UNIT II

Arithmetic Unit

Addition and subtraction of signed numbers – Design of fast adders – Multiplication of positive numbers - Signed operand multiplication and fast multiplication – Integer division – Floating point numbers and operations.

UNIT III

Basic Processing Unit

Fundamental concepts – Execution of a complete instruction – Multiple bus organization – Hardwired control – Microprogrammed control - Pipelining – Basic concepts – Data hazards – Instruction hazards – Influence on Instruction sets – Data path and control consideration – Superscalar operation.

UNIT IV

Memory System

Basic concepts – Semiconductor RAMs - ROMs – Speed - size and cost – Cache memories - Performance consideration – Virtual memory- Memory Management requirements – Secondary storage.

UNIT V

I/O Organization

Accessing I/O devices – Interrupts – Direct Memory Access – Buses – Interface circuits – Standard I/O Interfaces (PCI, SCSI, USB).

References:

1. Computer System Architecture, 3e, by M. Morris Mano, Pearson Education
2. Computer Organization and Architecture - Designing for Performance, 11e, by William Stallings, Pearson Education
3. Computer Architecture and Organisation: Schaum's Outlines Series, by Nicholas P. Carter, Raj Kamal, McGraw Hill Education
4. Computer Organization 5e, by Carl Hamacher, Zvonko Vranesic and Safwat Zaky, McGraw Hill Education
5. Computer Architecture and Organization, by John P. Hayes, McGraw Hill Education
6. Computer Organization and Design: The hardware/Software Interface, by David A. Patterson and John L. Hennessy, Morgan Kaufmann

R.K.D.F. UNIVERSITY, BHOPAL
B.TECH (Computer Science and Engineering)
SECOND YEAR, Semester – III
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (CSE)	Digital Circuit and System	CS-3041	3L-1T-2P	6

Course Outcomes:

CO1 Develop a digital logic and apply it to solve real life problems.

CO2 Analyze, design and implement combinational logic circuits.

CO3 Classify different semiconductor memories.

CO4 Analyze, design and implement sequential logic circuits

Course Contents:

UNIT I

Digital Fundamentals

Number Systems – Decimal, Binary, Octal, Hexadecimal, 1‘s and 2‘s complements, Codes – Binary, BCD, Excess 3, Gray, Alphanumeric codes, Boolean theorems, Logic gates, Universal gates, Sum of products and product of sums, Minterms and Maxterms, Karnaugh map Minimization and Quine-McCluskey method of minimization.

UNIT II

Combinational Circuit Design

Design of Half and Full Adders, Half and Full Subtractors, Binary Parallel Adder – Carry look ahead Adder, BCD Adder, Multiplexer, Demultiplexer, Magnitude Comparator, Decoder, Encoder, Priority Encoder.

UNIT III

Synchronous Sequential Circuits

Flip flops – SR, JK, T, D, Master/Slave FF – operation and excitation tables, Triggering of FF, Analysis and design of clocked sequential circuits – Design – Moore/Mealy models, state minimization, state assignment, circuit implementation – Design of Counters- Ripple Counters, Ring Counters, Shift registers, Universal Shift Register.

UNIT IV

Asynchronous Sequential Circuits

Stable and Unstable states, output specifications, cycles and races, state reduction, race free assignments, Hazards, Essential Hazards, Pulse mode sequential circuits, Design of Hazard free circuits

UNIT V

Memory Devices and Digital Integrated Circuits

Basic memory structure – ROM -PROM – EPROM – EEPROM –EAPROM, RAM – Static and dynamic RAM – Programmable Logic Devices – Programmable Logic Array (PLA) – Programmable Array Logic (PAL) – Field Programmable Gate Arrays (FPGA) – Implementation of combinational logic circuits using PLA, PAL. Digital integrated circuits: Logic levels, propagation delay, power dissipation, fan-out and fan-in, noise margin, logic families and their characteristics-RTL, TTL, ECL, CMOS

References:

1. Digital Logic and Computer Design By M. Morris Mano
2. Digital Circuits and Design 5e, By S. Salivahanan and S. Arivazhagan, Oxford University Press
3. Fundamentals of Digital 4e, by A. Anand Kumar, PHI Learning Private Limited
4. Digital Principles and Applications, 6e, by Donald P.Leach and Albert Paul Malvino, McGraw Hill Education
5. Digital Design, Principles and Practices, by John. F. Wakerly, Pearson Education
6. Digital Logic Applications and Design, by John.M Yarbrough, Thomson Learning

R.K.D.F. UNIVERSITY, BHOPAL
B.TECH (Computer Science and Engineering)
SECOND YEAR, Semester – III
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (CSE)	Value Education	CS-3051	3L-1T-2P	6

Course Outcomes:

CO1 To learn the philosophy of Life, personal value, social value, mind cultural value and personal health.

CO2 To learn professional ethical values, codes of ethics, responsibilities, safety, rights and related Global issues.

CO3 To know self-esteem, self-understanding, self-awareness.

CO4 To developing a social relationship.

Course Contents:

Chapter 1

Concepts of Values-Definition and Types of values –The need for Education in values-Challenges for Value adoption-Character development-Vision of a better world

Chapter 2

Inculcation of values
Classification of values- Personal Values-Family Values-Social Values-Spiritual values-Benefits of value adoption

Chapter 3

Values for Professional excellence
Definition-Purpose-implementation-situations to adopt-reflection questions-quotable quotes of Active listening-Decision making-Determination-Perseverance-Discipline-Responsibility

Chapter 4

Business ethics
Ethics and Entrepreneurship- Professional Ethics –Ethical choices- Resolving Ethical Dilemmas-Leadership and Social Responsibility- Corporate Social Responsibility

Chapter 5

Quality of Life
Dealing with change-Trends, Organizations and the Individual-Self and the world-Quality from within-Relating to others-The dynamics of personal powers

Chapter 6

Exploring the self
True Identity-Anatomy of the self-The cyclic processes within the self-States of the awareness-Innate and Acquired qualities-Empowering the

Chapter 7

Understanding Self-Esteem
Know self-esteem-Understanding the self-Components of self-esteem-Association with self-esteem-Levels of self-esteem-Reflection exercises

Chapter 8

Principles of living
Be introspective-Be an observer-Being optimistic - Appreciate differences - Don’t compare yourself with others-Live at present

Chapter 9

Practical Meditation
Why meditate? - Soul consciousness-The supreme-Karma-Timeless dimension-The eight powers

Chapter 10

Exercises for Practice
Quiet reflection- Practice introversion - Being an observer-Stand back and observe – Self-awareness (Soul consciousness) - Experiencing Body free stage-Reflect on original qualities - Visualize the Divine-Think attributes of the Supreme-Developing a living relationship-Surrender to God-Create Good wishes for all- Visualization in Meditation: Orbs of Light- The forest-The Balloon.

R.K.D.F. UNIVERSITY, BHOPAL
B.TECH (Computer Science and Engineering)
SECOND YEAR, Semester – III
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (CSE)	Software Lab 1 (C++)	CS-3061	0L-0T-2P	2

Course Outcomes:

After completing this course satisfactorily, a student will be able to:

CO1 Introduces Object Oriented Programming concepts using the C++ language.

CO2 Introduces the principles of data abstraction, inheritance and polymorphism.

CO3 Introduces the principles of virtual functions and polymorphism.

CO4 Introduces handling formatted I/O and unformatted I/O.

CO5 Introduces exception handling.

Course Contents:

UNIT I

Object-Oriented Thinking: Different paradigms for problem solving, need for OOP paradigm, differences between OOP and Procedure oriented programming, Overview of OOP concepts-Abstraction, Encapsulation, Inheritance and Polymorphism. C++ Basics: Structure of a C++ program, Data types, Declaration of variables, Expressions, Operators, Operator Precedence, Evaluation of expressions, Type conversions, Pointers, Arrays, Pointers and Arrays, Strings, Structures, References. Flow control statement-if, switch, while, for, do, break, continue, goto statements. Functions -Scope of variables, Parameter passing, Default arguments, inline functions, Recursive functions, Pointers to functions. Dynamic memory allocation and de-allocation operators - new and delete, Preprocessor directives.

UNIT –II

C++ Classes and Data Abstraction: Class definition, Class structure, Class objects, Class scope, this pointer, Friends to a class, Static class members, Constant member functions, Constructors and Destructors, Dynamic creation and destruction of objects, Data abstraction, ADT and information hiding.

UNIT –III

Inheritance: Defining a class hierarchy, Different forms of inheritance, Defining the Base and Derived classes, Access to the base class members, Base and Derived class construction, Destructors, Virtual base class. Virtual Functions and Polymorphism: Static and Dynamic binding, virtual functions, Dynamic binding through virtual functions, Virtual function call mechanism, Pure virtual functions, Abstract classes, Implications of polymorphic use of classes, Virtual destructors.

UNIT –IV

C++ I/O: I/O using C functions, Stream classes hierarchy, Stream I/O, File streams and String streams, Overloading operators, Error handling during file operations, Formatted I/O.

UNIT-V

Exception Handling: Benefits of exception handling, Throwing an exception, The try block, Catching an exception, Exception objects, Exception specifications, Stack unwinding, Rethrowing an exception, Catching all exceptions.

References:

1. C++ The Complete Reference, 4e, Herbert Schildt, Tata McGraw Hill
2. Problem solving with C++: The Object of Programming, 4e, Walter Savitch, Pearson Education
3. The C++ Programming Language, 3e, Bjarne Stroustrup, Pearson Education
4. Object Oriented Programming in C++, 3e, Robert Lafore, Galogotia Publications Pvt Ltd
5. Object Oriented Programming with C++, E. Balagurusamy, Tata McGraw Hill
6. Object Oriented Programming with C++, David Parsons, BPB Publications

R.K.D.F. UNIVERSITY, BHOPAL
B.TECH (Computer Science and Engineering)
SECOND YEAR, Semester – IV
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (CSE)	Environmental Engineering	CS-4011	4L-0T-0P	4

Course Outcomes:

CO1 Understand key current environmental problems

CO2 Be able to identify and value the effect of the pollutants on the environment: atmosphere, water and soil

CO3 Be able to plan strategies to control, reduce and monitor pollution.

CO4 Be able to select the most appropriate technique to purify and/or control the emission of pollutants.

CO5 Be able to apply the basis of an Environmental Management System (EMS) to an industrial activity.

Course Contents:

UNIT I

Ecosystem – Principles of ecology, ecosystem concept: Biotic and biotic components of ecosystem, Segments of Environment: Atmosphere, hydrosphere, Lithosphere, biosphere. Biodiversity: Threats and conservation, Food Chain.

UNIT II

Energy - General idea about: Natural Resources , current status and types of resources Non Renewable Sources of energy, coal, oil, Gas, Hydrogen, nuclear sources

UNIT III

Air Pollution & Sound Pollution - Air Pollution: Air pollutants, classification, (Primary & secondary Pollutants) Adverse effects of pollutants. Causes of Air pollution Environmental problems, (Global warming, ozone depletion and acid rain) General idea about forest ecosystem, grassland ecosystem, wetland ecosystems and aquatic Biogeochemical Cycling: Oxygen cycle, Carbon cycle, Nitrogen cycle, Sculpture cycle and water cycle.

UNIT IV

Water Pollution – Water Pollution: Pollutants in water, adverse effects. Treatment of Domestic & Industrial water effluent.

Soil Pollution – Soil Profile, Pollutants in soil, their adverse effects, controlling measures.

UNIT V

Society & Ethics – Impact of waste on society. Solid waste management (Nuclear, Thermal, Plastic, medical, Agriculture, domestic and e-waste). Ethics and moral values, ethical situations, water preservation rain water collection. Environmental Impact Assessment.

References:

1. Engineering Ethics, by CE Harris, MS Prichard, and MJ Rabin's, Cengage Learning Pvt. Ltd.
2. Essentials of Ecology and Environment, by SVS Rana, PHI Learning Pvt. Ltd.
3. Ethics in information Technology, by GW Raynold, Cengage Learning Pvt. Ltd.
4. Energy Environment & Ethics in Society, by Siva Kumar, McGraw Hill Education
5. Environmental Chemistry, by AK De, New Age International Publishers
6. Environmental Chemistry, by BK Sharma, Goel Publ. House

R.K.D.F. UNIVERSITY, BHOPAL
B.TECH (Computer Science and Engineering)
SECOND YEAR, Semester – IV
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (CSE)	Database Management System	CS-4021	4L-0T-2P	6

Course Outcomes:

After completing this course satisfactorily, a student will be able to:

CO1 Understand database concepts and structures and query language.

CO2 Understand the E-R model and relational model.

CO3 To design and build a simple database system and demonstrate competence with the fundamental tasks involved with modeling, designing, and implementing a DBMS.

CO4 Understand Functional Dependency and Functional Decomposition.

CO5 Apply various Normalization techniques.

Course Contents:

UNIT I

Introduction And Conceptual Modeling: Introduction to File and Database systems- Database system structure – Data Models – Introduction to Network and Hierarchical Models – ER model – Relational Model – Relational Algebra and Calculus.

UNIT II

Relational Model: SQL – Data definition- Queries in SQL- Updates- Views – Integrity and Security – Relational Database design – Functional dependencies and Normalization for Relational Databases (up to BCNF).

UNIT III

Data Storage and Query Processing: Record storage and Primary file organization- Secondary storage Devices- Operations on Files- Heap File- Sorted Files- Hashing Techniques – Index Structure for files – Different types of Indexes-B-Tree - B+ Tree – Query Processing.

UNIT IV

Transaction Management: Transaction Processing – Introduction- Need for Concurrency control- Desirable properties of Transaction - Schedule and Recoverability - Serializability and Schedules – Concurrency Control – Types of Locks- Two Phases locking- Deadlock- Time stamp-based concurrency control – Recovery Techniques – Concepts- Immediate Update- Deferred Update - Shadow Paging.

UNIT V

Current Trends: Object Oriented Databases – Need for Complex Data types- OO data Model- Nested relations- Complex Types- Inheritance Reference Types - Distributed databases- Homogenous and Heterogenous- Distributed data Storage – XML – Structure of XML- Data- XML Document- Schema- Querying and Transformation. – Data Mining and Data Warehousing.

References:

1. Database System Concepts, 4e, by Abraham Silberschatz, Henry F. Korth and S. Sudarshan, McGraw Hill Education
2. Database Management System, Raghu Ramakrishnan, Tata McGraw-Hill Education
3. Fundamental Database Systems 3e. by Ramez Elmasri and Shamkant B. Navathe, Pearson Education
4. An Introduction to Database Systems, 8e by CJ Date, Pearson Education
5. Database Systems: A Practical Approach to Design, Implementation and Management, 4e, by Thomas M. Connolly, Carolyn Begg, Pearson Education
6. Schaum's Outline of Fundamentals of Relational Databases by Ramon Mata-Toledo, Pauline Cushman, McGraw Hill Education

DBMS Lab (List of Experiments):

1. Data Definition Language (DDL) commands in RDBMS.
2. Data Manipulation Language (DML) and Data Control Language (DCL) commands in RDBMS.
3. High-level language extension with Cursors.
4. High level language extension with Triggers
5. Procedures and Functions.
6. Embedded SQL.
7. Database design using E-R model and Normalization.
8. Design and implementation of Payroll Processing System.
9. Design and implementation of Banking System.
10. Design and implementation of Library Information System.

R.K.D.F. UNIVERSITY, BHOPAL
B.TECH (Computer Science and Engineering)
SECOND YEAR, Semester – IV
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (CSE)	Software Engineering	CS-4031	3L-1T-2P	6

Course Outcomes:

After completing this course satisfactorily, a student will be able to:

CO1 Students will be able to decompose the given project in various phases of a lifecycle.

CO2 Students will be able to choose appropriate process model depending on the user requirements.

CO3 Students will be able perform various life cycle activities like Analysis, Design, Implementation, Testing and Maintenance

CO4 Students will be able to know various processes used in all the phases of the product.

CO5 Students can apply the knowledge, techniques, and skills in the development of a software product

Course Contents:

UNIT I

SOFTWARE PROCESS

Introduction –S/W Engineering Paradigm – life cycle models (water fall, incremental, spiral, WINWIN spiral, evolutionary, prototyping, object oriented) - system engineering – computer based system – verification – validation – life cycle process – development process –system engineering hierarchy.

UNIT II

SOFTWARE REQUIREMENTS

Functional and non-functional - user – system –requirement engineering process – feasibility studies– requirements – elicitation – validation and management – software prototyping – prototyping in the software process – rapid prototyping techniques – user interface prototyping -S/W document. Analysis and modeling – data, functional and behavioral models – structured analysis and data dictionary.

UNIT III

DESIGN CONCEPTS AND PRINCIPLES

Design process and concepts – modular design – design heuristic – design model and document. Architectural design – software architecture – data design – architectural design – transform and transaction mapping – user interface design – user interface design principles. Real time systems- Real

time software design – system design – real time executives – data acquisition system - monitoring and control system. SCM – Need for SCM – Version control – Introduction to SCM process – Software configuration items.

UNIT IV

TESTING

Taxonomy of software testing – levels – test activities – types of s/w test – black box testing – testing boundary conditions – structural testing – test coverage criteria based on data flow mechanisms– regression testing – testing in the large. S/W testing strategies – strategic approach and issues - unit testing – integration testing – validation testing – system testing and debugging.

UNIT V

SOFTWARE PROJECT MANAGEMENT

Measures and measurements – S/W complexity and science measure – size measure – data and logic structure measure – information flow measure. Software cost estimation – function point models – COCOMO model-Delphi method.- Defining a Task Network – Scheduling – Earned Value Analysis – Error Tracking - Software changes – program evolution dynamics – software maintenance – Architectural evolution. Taxonomy of CASE tools.

References:

1. Software Engineering - A Practitioner's Approach 6e, by Roger S. Pressman, McGraw-Hill International Edition
2. Software Engineering, 6e, by Ian Sommerville, Pearson Education Asia
3. An Integrated Approach to Software Engineering, by Pankaj Jalote, Springer Verlag
4. Software Engineering – An Engineering Approach, by James F Peters and Witold Pedryez, John Wiley & Sons
5. Fundamentals of Software Engineering, by Rajib Mall, PHI

Practical and Lab work Lab work should include a running case study problem for which different deliverables at the end of each phase of a software development life cycle are to be developed. This will include modeling the requirements, architecture and detailed design. Subsequently the design models will be coded and tested. For modeling, tools like Rational Rose products. For coding and testing, IDE like Eclipse, Net Beans, and Visual Studio can be used.

R.K.D.F. UNIVERSITY, BHOPAL
B.TECH (Computer Science and Engineering)
SECOND YEAR, Semester – IV
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (CSE)	Design and Analysis of Algorithm	CS-4041	3L-1T-2P	6

Course Outcomes:

After completing this course satisfactorily, a student will be able to:

CO1 Analyze the asymptotic performance of algorithms.

CO2 Write rigorous correctness proofs for algorithms

CO3 Demonstrate a familiarity with major algorithms and data structures.

CO4 Apply important algorithmic design paradigms and methods of analysis.

CO5 Synthesize efficient algorithms in common engineering design situations.

Course Contents:

UNIT I

BASIC CONCEPTS OF ALGORITHMS

Introduction – Notion of Algorithm – Fundamentals of Algorithmic Solving – Important Problem types – Fundamentals of the Analysis Framework – Asymptotic Notations and Basic Efficiency Classes.

UNIT II

MATHEMATICAL ASPECTS AND ANALYSIS OF ALGORITHMS

Mathematical Analysis of Non-recursive Algorithm – Mathematical Analysis of Recursive Algorithm– Example: Fibonacci Numbers – Empirical Analysis of Algorithms – Algorithm Visualization.

UNIT III

ANALYSIS OF SORTING AND SEARCHING ALGORITHMS

Brute Force – Selection Sort and Bubble Sort – Sequential Search and Brute-force string matching– Divide and conquer – Merge sort – Quick Sort – Binary Search – Binary tree- Traversal and Related Properties – Decrease and Conquer – Insertion Sort – Depth first Search and Breadth First Search.

UNIT IV

ALGORITHMIC TECHNIQUES

Transform and conquer – Presorting – Balanced Search trees – AVL Trees – Heaps and Heap sort – Dynamic Programming – Warshall's and Floyd's Algorithm – Optimal Binary Search trees– Greedy Techniques – Prim's Algorithm – Kruskal's Algorithm – Dijkstra's Algorithm – Huffman trees.

UNIT V

ALGORITHM DESIGN METHODS

Backtracking – n-Queen's Problem – Hamiltonian Circuit problem – Subset-Sum problem – Branch and bound – Assignment problem – Knapsack problem – Traveling salesman problem.

References:

1. Introduction to Algorithms 2e, by T.H. Cormen, C.E. Leiserson, R.L. Rivest and C. Stein, PHI Learning Pvt. Ltd.
2. Fundamentals of Computer Algorithms by Sartaj Sahni, Sanguthevar Rajasekaran and Ellis Horowitz, University Press
3. Anany Levitin, "Introduction to the Design and Analysis of Algorithm", Pearson Education Asia,
4. Sara Baase and Allen Van Gelder, "Computer Algorithms - Introduction to Design and Analysis",

R.K.D.F. UNIVERSITY, BHOPAL
B.TECH (Computer Science and Engineering)
SECOND YEAR, Semester – IV
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (CSE)	Computer Network	CS-4051	3L-1T-2P	6

Course Outcomes:

After completing this course satisfactorily, a student will be able to:

CO1 Understand and describe the layered protocol model.

CO2 Understand and explain data communications System and its components

CO3 Identify the different types of network topologies and protocols.

CO4 Identify the different types of network devices and their functions within a network.

CO5 Understand and building the skills of subnetting and routing mechanisms.

Course Contents:

UNIT I

DATA COMMUNICATIONS

Components – Direction of Data flow – networks – Components and Categories – types of Connections – Topologies –Protocols and Standards – ISO / OSI model – Transmission Media – Coaxial Cable – Fiber Optics – Line Coding – Modems – RS232 Interfacing sequences.

UNIT II

DATA LINK LAYER

Error – detection and correction – Parity – LRC – CRC – Hamming code – low Control and Error control - stop and wait – go back-N ARQ – selective repeat ARQ- sliding window – HDLC. - LAN - Ethernet IEEE 802.3 - IEEE 802.4 - IEEE 802.5 - IEEE 802.11 – FDDI - SONET – Bridges.

UNIT III

NETWORK LAYER

Internetworks – Packet Switching and Datagram approach – IP addressing methods – Subnetting– Routing – Distance Vector Routing – Link State Routing – Routers.

UNIT IV

TRANSPORT LAYER

Duties of transport layer – Multiplexing – Demultiplexing – Sockets – User Datagram Protocol (UDP) – Transmission Control Protocol (TCP) – Congestion Control – Quality of services (QOS) – Integrated Services.

UNIT V

APPLICATION LAYER

Domain Name Space (DNS) – SMTP – FTP – HTTP - WWW – Security – Cryptography.

References:

1. Computer Networks, 2e, by Andrew S. Tanenbaum, Pearson Education
2. Data Communication and Networking 2e, by Behrouz A. Forouzan, Tata McGraw-Hill
3. Data and Computer Communications 10e, by William Stallings, Pearson Education
4. Computer Networking: A Top-Down Approach Featuring the Internet, by James F. Kurose and Keith W. Ross, Pearson Education
5. Computer Networks 2e by Larry L. Peterson and Peter S. Davie, Harcourt Asia Pvt. Ltd.

NETWORKING LAB LIST OF EXPERIMENTS

All the programs are to be written using C:

1. Simulation of ARP / RARP.
2. Write a program that takes a binary file as input and performs bit stuffing and CRC Computation.
3. Develop an application for transferring files over RS232.
4. Simulation of Sliding-Window protocol.
5. Simulation of BGP / OSPF routing protocol.
6. Develop a Client – Server application for chat.
7. Develop a Client that contacts a given DNS Server to resolve a given host name.
8. Write a Client to download a file from a HTTP Server.
9. Study of Network Simulators like NS2/Glomosim / OPNET

R.K.D.F. UNIVERSITY, BHOPAL
B.TECH (Computer Science and Engineering)
SECOND YEAR, Semester – IV
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (CSE)	Software Lab II (Java)	CS-4061	0L-0T-2P	2

Course Outcomes:

After completing this course satisfactorily, a student will be able to:

CO1 Implement Object Oriented programming concept using basic syntaxes of control Structures, strings and function for developing skills of logic building activity.

CO2 Identify classes, objects, members of a class and the relationships among them needed for a finding the solution to specific problem.

CO3 Demonstrates how to achieve reusability using inheritance, interfaces and packages and describes faster application development can be achieved.

CO4 Demonstrate understanding and use of different exception handling mechanisms and concept of multithreading for robust faster and efficient application development

CO5 Identify and describe common abstract user interface components to design GUI in Java using Applet & AWT along with response to events

Course Contents:

UNIT I

Basic Java Features - C++ Vs JAVA, JAVA virtual machine, Constant & Variables, Data Types, Class, Methods, Objects, Strings and Arrays, Type Casting, Operators, Precedence relations, Control Statements, Exception Handling, File and Streams, Visibility, Constructors, Operator and Methods Overloading, Static Members, Inheritance: Polymorphism, Abstract methods and Classes

UNIT–II

Java Collective Frame Work - Data Structures: Introduction, Type-Wrapper Classes for Primitive Types, Dynamic Memory Allocation, Linked List, Stack, Queues, Trees, Generics: Introduction, Overloading Generic Methods, Generic Classes, Collections: Interface Collection and Class Collections, Lists, Array List and Iterator, Linked List, Vector. Collections Algorithms: Algorithm sorts, Algorithm shuffle, Algorithms reverse, fill, copy, max and min Algorithm binary Search, Algorithms add All, Stack Class of Package java. Util, Class Priority Queue and Interface Queue, Maps, Properties Class, Un-modifiable Collections.

UNIT–III

Advance Java Features - Multithreading: Thread States, Priorities and Thread Scheduling, Life Cycle of a Thread, Thread Synchronization, Creating and Executing Threads, Multithreading with GUI, Monitors and Monitor Locks. Networking: Manipulating URLs, Reading a file on a Web Server, Socket programming, Security and the Network, RMI, Networking, Accessing Databases with JDBC: Relational Database, SQL, MySQL, Oracle

UNIT–IV

Advance Java Technologies - Servlets: Overview and Architecture, Setting Up the Apache Tomcat Server, Handling HTTP get Requests, Deploying a web Application, Multitier Applications, Using JDBC from a Servlet, Java Server Pages (JSP): Overview, First JSP Example, Implicit Objects, Scripting, Standard Actions, Directives, Multimedia: Applets and Application: Loading, Displaying and Scaling Images, Animating a Series of Images, Loading and playing Audio clips

UNIT–V

Advance Web/Internet Programming (Overview): J2ME, J2EE, EJB, XML.

References:

1. Java The Complete Reference, by Herbert Schildt, Tata McGraw Hill
2. Java How to Program, by Deitel & Deitel, Pearson Education
3. Programming with Java by E. Balaguruswamy, Tata McGraw Hill
4. Head First Java: A Brain-Friendly Guide, 3e, by Kathy Sierra, Bert Bates, and Trisha Gee, O'Reilly Media Inc.
5. Let Us Java, by Yashvant Kanetkar and Anuj Kanetkar, BPL Publications

List of Program to be perform (Expandable)

1. Installation of JDK
2. Write a program to show Concept of CLASS in Java
3. Write a program to show Type Casting in Java
4. Write a program to show How Exception Handling is in Java
5. Write a Program to show Inheritance
6. Write a program to show Polymorphism

R.K.D.F. UNIVERSITY, BHOPAL
B.TECH (Computer Science and Engineering)
THIRD YEAR, Semester – V
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (CSE)	Operating Systems	CS-5011	4L-0T-2P	6

Course Outcomes:

CO1 Understand the basics of operating systems like kernel, shell, types and views of operating systems.

CO2 Describe the various CPU scheduling algorithms and remove deadlocks.

CO3 Explain various memory management techniques and concept of thrashing.

CO4 Use disk management and disk scheduling algorithms for better utilization of external memory.

CO5 Recognize file system interface, protection and security mechanisms.

Course Contents:

UNIT I

INTRODUCTION

Introduction - Mainframe systems – Desktop Systems – Multiprocessor Systems – Distributed Systems – Clustered Systems – Real Time Systems – Handheld Systems - Hardware Protection – System Components – Operating System Services – System Calls – System Programs - Process Concept – Process Scheduling – Operations on Processes – Cooperating Processes – Inter- process Communication.

UNIT II

SCHEDULING

Threads – Overview – Threading issues - CPU Scheduling – Basic Concepts – Scheduling Criteria– Scheduling Algorithms – Multiple-Processor Scheduling – Real Time Scheduling - The Critical-Section Problem – Synchronization Hardware – Semaphores – Classic problems of Synchronization– Critical regions– Monitors.

UNIT III

DEADLOCKS

System Model – Deadlock Characterization – Methods for handling Deadlocks -Deadlock Prevention– Deadlock avoidance – Deadlock detection – Recovery from Deadlocks - Storage Management– Swapping – Contiguous Memory allocation – Paging – Segmentation – Segmentation with Paging.

UNIT IV

PAGING AND FILE SYSTEM

Virtual Memory – Demand Paging – Process creation – Page Replacement – Allocation of frames– Thrashing - File Concept – Access Methods – Directory Structure – File System Mounting – File Sharing – Protection

UNIT V

FILE MANAGEMENT

File System Structure – File System Implementation – Directory Implementation – Allocation Methods – Free-space Management. Kernel I/O Subsystems - Disk Structure – Disk Scheduling – Disk Management – Swap-Space Management. Case Study: The Linux System, Windows

References:

1. Operating System Concepts, by Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, John Wiley & Sons
2. Operating Systems 2e, by Harvey M. Deitel, Pearson Education
3. Modern Operating Systems, by Andrew S. Tanenbaum, Pearson Education
4. Operating Systems Internal and Design, by William Stallings, Pearson Education
5. Operating System Design: The Xinu Approach, 2e, by Douglas E. Comer, CRC Press

List of Experiment

1. Write a program to implement FCFS CPU scheduling algorithm.
2. Write a program to implement SJF CPU scheduling algorithm.
3. Write a program to implement Priority CPU Scheduling algorithm.
4. Write a program to implement Round Robin CPU scheduling algorithm.
5. Write a program to compare various CPU Scheduling Algorithms over different Scheduling Criteria.
6. Write a program to implement classical inter process communication problem.
7. Write a program to implement classical inter process communication problem.
8. Write a program to implement classical inter process communication problem.
9. Write a program to implement & Compare various page replacement algorithms.
10. Write a program to implement & Compare various Disk & Drum scheduling Algorithms.
11. Write a program to implement Banker’s algorithms.
12. Write a program to implement Remote Procedure Call (RPC).
13. Write a Devices Drivers for any Device or peripheral.

R.K.D.F. UNIVERSITY, BHOPAL
B.TECH (Computer Science and Engineering)
THIRD YEAR, Semester – V
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (CSE)	Object Oriented Programming	CS-5021	3L-1T-2P	6

Course Outcomes:

After completing this course satisfactorily, a student will be able to:

CO1 Articulate the principles of object-oriented problem solving and programming.

CO2 Apply the concepts of class, method, constructor, instance, data abstraction, function abstraction, inheritance, overriding, overloading, and polymorphism

CO3 Program using objects and data abstraction, class, and methods in function abstraction

CO4 Analyze, write, debug, and test basic C++ codes using the approaches introduced in the course.

CO5 Analyze problems and implement simple C++ applications using an object-oriented software engineering approach

Course Contents:

UNIT I

Principles of OOP, procedure oriented programming vs. object oriented programming, basic concepts, advantages, application of OOPs, object oriented languages. Beginning with C++: structure of C++ program, creating, compiling, linking & executing a C++ program, Tokens, expressions & control structures, keywords, identifiers, basic data types, user-defined data types, derived data types, symbolic constants, type compatibility, variable declaration, dynamic initialization of variables, reference variables, operators in C++.

UNIT II

Scope resolution operator, memory management operators, manipulators, type cast operators, operator precedence, control structures. Main function, function prototyping, call by reference, call by value, inline functions, default arguments, constant arguments, function overloading. Introduction to constructors and destructors, operator overloading & type conversions.

UNIT III

Specifying a class, defining member functions, making an outside function inline, private member function; array within a class, memory allocation for objects , static data members, static member functions, array of objects, objects as function arguments, returning objects.

UNIT IV

Friend functions, Inheritance and its various types along with programs, introduction to pointers, pointers to object, pointers to derived classes, virtual functions and polymorphism, this pointer.

UNIT V

Managing console I/O operations: introduction, C++ streams, C++ stream classes, unformatted I/O operations, formatted console I/O operations, managing O/P with manipulators. Working with Sequential Date Files: Introduction, opening & closing a file, detecting EOF, sequential input & output operations.

References:

1. C++ The Complete Reference, 4e, Herbert Schildt, Tata McGraw Hill
2. Problem solving with C++: The Object of Programming, 4e, Walter Savitch, Pearson Education
3. The C++ Programming Language, 3e, Bjarne Stroustrup, Pearson Education
4. Object Oriented Programming in C++, 3e, Robert Lafore, Galogotia Publications Pvt Ltd
5. Object Oriented Programming with C++, E. Balagurusamy, Tata McGraw Hill
6. Object Oriented Programming with C++, David Parsons, BPB Publications

R.K.D.F. UNIVERSITY, BHOPAL
B.TECH (Computer Science and Engineering)
THIRD YEAR, Semester – V
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (CSE)	Discrete Structure	CS-5031(A)	4L-0T-0P	4

Course Outcomes:

After completing this course satisfactorily, a student will be able to:

CO1 Write an argument using logical notation and determine if the argument is or is not valid.

CO2 Demonstrate the ability to write and evaluate a proof or outline the basic structure of and give examples of each proof technique described.

CO3 Understand the basic principles of sets and operations in sets.

CO4 Demonstrate an understanding of relations and functions and be able to determine their properties.

CO5 Model problems in Computer Science using graphs and trees.

Course Contents:

UNIT I

Set Theory- Introduction, Elements & Description, Types, Venn-Euler Diagrams, Operations, Inclusion and Exclusion Principle, Fuzzy sets, Functions- Introduction, Types, Range & Domain, Identity Function, Relations-Binary relation, Types, Partial Order, Equivalence relation, Hasse Diagram.

UNIT II

Principle of Mathematical Induction, Pigeonhole Principle, Mathematical Logic- Introduction, propositional calculus, Logical operation, Statement, Converse, Inverse & Contra-positive Statement, Tautologies, Contradiction, Quantifiers, Predicate calculus.

UNIT III

Algebric Structures- Introduction, Mathematical Operations, Binary operations, Groups- Permutation Groups, Cyclic Groups, Subgroup, Semigroup and Monoid, Homeomorphism and Isomorphism, Rings, Fields, Poset and Lattices – Introduction, Chain, Lattice, Duality, Types of Lattices.

UNIT IV

Graph Theory- Introduction, Types, Path, Cycles, Subgraph, Isomprphic Graph, Homeomorphic Graph, Eularian and Hamiltonian graphs, Shortest Path Problem, Planar Graph, Graph Colouring and Chromatic Polynomials, Trees-Introduction, Properties, Binary tree, Computer representation of General Trees, Binary search Tree, Spanning Trees.

UNIT V

Recurrence Relations and Generating Functions- Introduction, Linear Recurrence Relations with Constant Coefficients, Methods of Solving Recurrence relations, Non-homogeneous Recurrence Relations, Methods of Generating Functions.

References:

1. Schaum's Outlines Discrete Mathematics 3e, by Seymour Lipschutz, Marc Laras Lipson, Varsha H. Patil, McGraw Hill Education
2. Discrete Mathematics and Its Applications 8e by Kenneth H. Rosen, Kamala Krithivasan, McGraw Hill Education
3. Discrete Mathematics with Ducks 2e, by Sarah-Marie Belcastro, CRC Press
4. Discrete Mathematics with Applications (Metric Version) 5e, by Susanna S. Epp, Cengage Learning India Pvt. Ltd.
5. Elements of Discrete Mathematics: A Computer Oriented Approach 4e, by C Liu, D. Mohapatra, McGraw Hill Education
6. Discrete Mathematics 4e, by JK Sharma, Trinity Press
7. Discrete Mathematics with Graph Theory 3e, by Edgar Goodaire and Michael Parmenter, Pearson Education

R.K.D.F. UNIVERSITY, BHOPAL
B.TECH (Computer Science and Engineering)
THIRD YEAR, Semester – V
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (CSE)	Cyber Security	CS-5031(B)	4L-0T-0P	4

Course Outcomes:

After completing this course satisfactorily, a student will be able to:

CO1 Be able to analyze and evaluate the cyber security needs of an organization.

CO2 Be able to Determine and analyze software vulnerabilities and security solutions to reduce the risk of exploitation.

CO3 Be able to Measure the performance and troubleshoot cyber security systems.

CO4 Be able to Implement cyber security solutions and use of cyber security, information assurance, and cyber/computer forensics software/tools.

CO5 Be able to Design and develop security architecture for an organization.

Course Contents:

UNIT I

Introduction of Cyber Crime, Challenges of cyber-crime, Classifications of Cybercrimes: E- Mail Spoofing, Spamming, Internet Time Theft, Salami attack/Salami Technique, Data Diddling, Web jacking, Online Frauds, Software Piracy, Computer Network Intrusions, Password Sniffing, Identity Theft, cyber terrorism, Virtual Crime , Perception of cyber criminals: hackers, insurgents and extremist group etc. Web servers hacking, session hijacking.

UNIT II

Cybercrime on Mobile and Wireless Device: Proliferation of Mobile and Wireless Devices, trends in Mobility Credit Card Frauds in Wireless Computing, Types and techniques of Credit Card Frauds, Attacks on Mobiles: Mobile Viruses, Mishing, Vishing, Smishing & Hacking Bluetooth. Web servers hacking, session hijacking.

UNIT III

Tools and Methods in Cybercrime: Proxy Servers and Anonymizers, Password Cracking, Keyloggers and Spyware, virus and worms, Trojan Horses, Backdoors, DoS and DDoS Attacks , Buffer and Overflow, Attack on Wireless Networks, Phishing : Method of Phishing, Phishing Techniques.

UNIT IV

Cyber Crime and Criminal justice: Concept of Cyber Crime and the IT Act, 2000, Hacking, Teenage Web Vandals, Cyber Fraud and Cheating, Defamation, Harassment and E-mail Abuse, Other IT Act Offences, Monetary Penalties, jurisdiction and Cyber Crimes, Nature of Criminality, Strategies to tackle Cyber Crime and Trends. The Indian Evidence Act of 1872 v. Information Technology Act, 2000: Status of Electronic Records as Evidence, Proof and Management of Electronic Records; Relevancy, Admissibility and Probative Value of E-Evidence, Proving Digital Signatures, Proof of Electronic Agreements, Proving Electronic Messages.

UNIT V

Introduction to Cyber Forensics: Information Security Investigations, Corporate Cyber Forensics, Scientific Method in Forensic analysis, investigating large scale Data breach cases. Analyzing Malicious software. Types of Computer Forensics Technology, Types of Business Computer Forensic Technology, Specialized Forensics Techniques.

References:

1. Principles of Cyber Crime, by Jonathan Clough, Cambridge University Press
2. Computer Forensics: Computer Crime Scene Investigation, 2e, by John R. Vacc, Charles River Media
3. Cyber Law Simplified, by Vivek Sood, Tata McGraw Hill
4. Cyber Security, by Nina Godbole and Sunit Belapure, Willey-India
5. Information Warfare: Corporate attack and defense in digital world, by William Hutchinson and Mathew Warren, Elsevier
6. Cyber Laws and IT Protection, by Harish Chander, PHI.

R.K.D.F. UNIVERSITY, BHOPAL
B.TECH (Computer Science and Engineering)
THIRD YEAR, Semester – V
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (CSE)	Data Analytics	CS-5031(C)	4L-0T-0P	4

Course Outcomes:

After completing this course satisfactorily, a student will be able to:

CO1 Understand the basic of data analytics using concept of statistics and probability.

CO2 Understand the needs of data processing techniques.

CO3 Implement the data analytics techniques using R, MATLAB and Python.

CO4 Apply the data analytics techniques in real life applications.

Course Contents:

UNIT I

Data Definitions and Analysis Techniques

Elements, Variables, and Data categorization, Levels of Measurement, Data management and indexing, Introduction to statistical learning and R-Programming,

UNIT II

Descriptive Statistics

Measures of central tendency, Measures of location of dispersions, Practice and analysis with R,

UNIT III

Basic Analysis Techniques

Basic analysis techniques, Statistical hypothesis generation and testing, Chi-Square test, T-Test, Analysis of variance, Correlation analysis, Maximum likelihood test,
Practice and analysis with R

UNIT IV

Data Analysis Techniques

Regression analysis, Classification techniques, Clustering, Association rules analysis, Practice and analysis with R

UNIT V

Case Studies and Projects

Understanding business scenarios, Feature engineering and visualization, Scalable and parallel computing with Hadoop and Map-Reduce, Sensitivity Analysis

References:

1. Probability and Statistics for Engineers and Scientists 9e, by Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers and Keying Ye, Pearson Education
2. The Elements of Statistical Learning: Data Mining Inference and Prediction 2e, by Trevor Hastie, Robert Tibshirani, Jerome Friedman, Springer
3. Mining of Massive Datasets, 2e, by Jure Leskovec, Anand Rajaraman, Jeffrey David Ullman, Dreamtech Press
4. An Introduction to Statistical Learning: with Applications in Python, by Gareth James, Daniela Witten, and Trevor Hastie, Springer

R.K.D.F. UNIVERSITY, BHOPAL
B.TECH (Computer Science and Engineering)
THIRD YEAR, Semester – V
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (CSE)	Theory of Computation	CS-5041(A)	4L-0T-0P	4

Course Outcomes:

After completing this course satisfactorily, a student will be able to:

CO1 Demonstrate knowledge of basic mathematical models of computation and describe how they relate to formal languages

CO2 Understand that there are limitations on what computers can do, and learn examples of unsolvable problems.

CO3 Learn that certain problems do not admit efficient algorithms, and identify such problems

CO4 Apply knowledge of computing and mathematics appropriate to the discipline

CO5 Function effectively as a member of a team in order to accomplish a common goal.

Course Contents:

UNIT I

AUTOMATA

Introduction to formal proof – Additional forms of proof – Inductive proofs –Finite Automata (FA) – Deterministic Finite Automata (DFA) – Non-deterministic Finite Automata (NFA) – Finite Automata with Epsilon transitions.

UNIT II

REGULAR EXPRESSIONS AND LANGUAGES

Regular Expression – FA and Regular Expressions – Proving languages not to be regular – Closure properties of regular languages – Equivalence and minimization of Automata.

UNIT III

CONTEXT-FREE GRAMMAR AND LANGUAGES

Context-Free Grammar (CFG) – Parse Trees – Ambiguity in grammars and languages – Definition of the Pushdown automata – Languages of a Pushdown Automata – Equivalence of Pushdown automata and CFG, Deterministic Pushdown Automata.

UNIT IV

PROPERTIES OF CONTEXT-FREE LANGUAGES

Normal forms for CFG – Pumping Lemma for CFL - Closure Properties of CFL – Turing Machines– Programming Techniques for TM.

UNIT V

UNDECIDABILITY

A language that is not Recursively Enumerable (RE) – An undecidable problem that is RE – Undecidable problems about Turing Machine – Post's Correspondence Problem - The classes P and NP.

References:

1. Introduction to Languages and the Theory of Computation 4e, by John C. Martin, McGraw Hill Education
2. Introduction to Automata Theory, Languages, and Computation, 3e by John E. Hopcroft, Rajeev Motwani, and Jeffrey D. Ullman, Pearson Education
3. Introduction to the Theory of Computation, 3e, by Michael Sipser, Cengage India Pvt. Ltd.
4. Theory of Computer Science: Automata, Languages and Computation 3e, by KLP Mishra and N. Chandrsekaran, PHI Learning Pvt. Ltd.
5. Theory of Computation Simplified, by Varsha H. Patil, Vaishali S. Pawar, Swati A. Bhvsar, Aboli H. Patil, BPB Publications
6. An Introduction to Formal Languages and Automata 7e, by Peter Linz, and Susan H. Rodge, Jones and Bartlett Publishers, Inc.
7. Elements of The theory of Computation 2e, HR Lewis and CH Papadimitriou, Pearson Education

R.K.D.F. UNIVERSITY, BHOPAL
B.TECH (Computer Science and Engineering)
THIRD YEAR, Semester – V
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (CSE)	Internet and Web Technology	CS-5041(B)	4L-0T-0P	4

Course Outcomes:

After completing this course satisfactorily, a student will be able to:

CO1 Describe the concepts of WWW including browser and HTTP protocol.

CO2 Develop modern web pages using the HTML and CSS features with different layouts as per the needs of application.

CO3 Use the JavaScript to develop the dynamic web pages.

CO4 Develop the modern web application using the client and server-side technologies and web design fundamentals

CO5 User server-side scripting with PHP to generate the web pages dynamically using the data base connectivity.

Course Contents:

UNIT I

Introduction to Internet: Internet, Growth of Internet, Owners of the Internet, Anatomy of Internet, ARPANET and Internet history of the World Wide Web, basic Internet Terminology, Net etiquette. Internet Applications – Commerce on the Internet, Governance on the Internet, Impact of Internet on Society – Crime on/through the Internet.

UNIT II

TCP/IP: Internet Technology and Protocol, Packet switching technology, Internet Protocols: TCP/IP, Router, Internet Addressing Scheme: Machine Addressing (IP address), E-mail Addresses, Resources Addresses

UNIT III

Introduction to HTML: The development process, Html tags and simple HTML forms, web site structure Introduction to XHTML: XML, Move to XHTML, Meta tags, Character entities, frames and frame sets, inside browser.

DHTML: Combining HTML, CSS and JavaScript, events and buttons, controlling your browser. XML: Introduction to XML, uses of XML, simple XML, XML key components, DTD and Schemas, Well formed, using XML with application.XML, XSL and XSLT. Introduction to XSL, XML transformed simple example, XSL elements, transforming with XSLT

UNIT IV

Style Sheets: Need for CSS, introduction to CSS, basic syntax and structure, using CSS, background images, colors and properties, manipulating texts, using fonts, borders and boxes, margins, padding lists, positioning using CSS, CSS2

JavaScript: Client side scripting, What is JavaScript, How to develop JavaScript, simple JavaScript, variables, functions, conditions, loops and repetition

UNIT V

Web Publishing and Browsing:

Overview, SGML, Web hosting, HTML. CGL, Documents Interchange Standards, Components of Web Publishing, Document management, Web Page Design Consideration and Principles, Search and Meta Search Engines, WWW, Browser, HTTP, Publishing Tools

References:

1. HTML Black Book, by Steven Holzner, Dremtech Press
2. Web Technologies Black Book, Dreamtech Press
3. Web Applications: Concepts and Real-World Design, by Knuckles, Wiley-India
4. Internet and World Wide Web How to Program, by P.J. Deitel & H.M. Deitel Pearson Education

R.K.D.F. UNIVERSITY, BHOPAL
B.TECH (Computer Science and Engineering)
THIRD YEAR, Semester – V
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (CSE)	Introduction to DBMS	CS-5041(C)	4L-0T-0P	4

Course Outcomes:

After completing this course satisfactorily, a student will be able to:

CO1 Describe the characteristics of database, architecture and languages of Database system.

CO2 Implement Entity-Relationship diagrams.

CO3 Apply relational model concepts and constraints.

CO4 Apply normalization techniques for relational databases and familiarize with transaction processing.

CO5 Develop programs using PL/SQL.

Course Contents:

UNIT I

BASIC CONCEPTS: Database Management System - File based system - Advantages of DBMS over file-based system - Database Approach - Logical DBMS Architecture - Three level architecture of DBMS or logical DBMS architecture - Need for three level architecture - Physical DBMS Architecture - Database Administrator (DBA) Functions & Role - Data files indices and Data Dictionary - Types of Database. Relational and ER Models: Data Models - Relational Model – Domains - Tuple and Relation - Super keys - Candidate keys - Primary keys and foreign key for the Relations - Relational Constraints - Domain Constraint - Key Constraint - Integrity Constraint - Update Operations and Dealing with Constraint Violations - Relational Operations - Entity Relationship (ER) Model – Entities – Attributes – Relationships - More about Entities and Relationships - Defining Relationship for College Database - E-R Diagram - Conversion of E-R Diagram to Relational Database

UNIT-II

DATABASE INTEGRITY AND NORMALISATION: Relational Database Integrity - The Keys - Referential Integrity - Entity Integrity - Redundancy and Associated Problems – Single Valued Dependencies – Normalisation - Rules of Data Normalisation - The First Normal Form -The Second Normal Form - The Third Normal Form - Boyce Codd Normal Form - Attribute Preservation – Lossless join Decomposition - Dependency Preservation. File Organisation: Physical Database Design Issues - Storage of Database on Hard Disks - File Organisation and Its Types - Heap files (Unordered files) - Sequential File Organisation - Indexed (Indexed Sequential) File Organisation - Hashed File Organisation - Types of Indexes - Index and Tree Structure - Multi-key File Organisation - Need for Multiple Access Paths - Multi-list File Organisation - Inverted File Organisation.

UNIT-III

STRUCTURES QUERY LANGUAGE (SQL): Meaning – SQL commands - Data Definition Language - Data Manipulation Language - Data Control Language - Transaction Control Language - Queries using Order by – Where - Group by - Nested Queries. Joins – Views – Sequences - Indexes and Synonyms - Table Handling.

UNIT-IV

TRANSACTIONS AND CONCURRENCY MANAGEMENT: Transactions - Concurrent Transactions - Locking Protocol - Serialisable Schedules - Locks Two Phase Locking (2PL) - Deadlock and its Prevention - Optimistic Concurrency Control. Database Recovery and Security: Database Recovery meaning - Kinds of failures - Failure controlling methods - Database errors - Backup & Recovery Techniques - Security & Integrity - Database Security - Authorization.

UNIT-V

DISTRIBUTED AND CLIENT SERVER DATABASES: Need for Distributed Database Systems - Structure of Distributed Database - Advantages and Disadvantages of DDBMS - Advantages of Data Distribution - Disadvantages of Data Distribution - Data Replication - Data Fragmentation. Client Server Databases: Emergence of Client Server Architecture - Need for Client Server Computing - Structure of Client Server Systems & its advantages.
LAB: SQL Queries Based on Various Commands.

References:

1. Database System Concepts, 4e, by Abraham Silberschatz, Henry F. Korth and S. Sudarshan, McGraw Hill Education
2. Database Management System, Raghu Ramakrishnan, Tata McGraw-Hill Education
3. Fundamental Database Systems 3e. by Ramez Elmasri and Shamkant B. Navathe, Pearson Education
4. An Introduction to Database Systems, 8e by CJ Date, Pearson Education
5. Database Systems: A Practical Approach to Design, Implementation and Management, 4e, by Thomas M. Connolly, Carolyn Begg, Pearson Education
6. Schaum's Outline of Fundamentals of Relational Databases by Ramon Mata-Toledo, Pauline Cushman, McGraw Hill Education
7. SQL, PL/SQL – The Programming Language of Oracle by Ivan Bayross, BPB Publications

R.K.D.F. UNIVERSITY, BHOPAL
B.TECH (Computer Science and Engineering)
THIRD YEAR, Semester – V
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (CSE)	Lab (Linux)	CS-5051	0L-0T-2P	2

Course Outcomes:

After completing this course satisfactorily, a student will be able to:

CO1 Explain the fundamental concepts of open-source operating system Linux

CO2 Understand the basic set of commands and editors in Linux operating system.

CO3 Discuss shell programming in Linux operating system

Course Contents:

UNIT I

Linux Utilities:

File handling utilities, Security by file permissions, Process utilities, Disk utilities, Networking commands, Filters, Text processing utilities, Backup utilities Sed - Scripts, Operations, Addresses, Commands, awk - Execution, Fields and Records, Scripts, Operations, Actions, Assocoative Array, Strings and Mathematical functions, System commands in awk, Applications. Shell programming with Bourne Again Shell (bash): Introduction, Shell responsibilities, Pipes and redirection, here documents, running a shell script, Shell as a programming language, Shell meta characters, File-name substitution, Shell variables, Command substitution, Shell commands, the environment, Quoting, test command, Control structures, Arithmetic in shell, Shell script examples, Interrupt processing functions, Debugging shell Scripts

UNIT II

Files and Directories:

File concepts, File types File system structure, file metadata - Inodes, kernel support for files, System calls for the file I/O operations- open, create, read, wrirte, close, lseek, dup2, file status information-stat family, file and record locking-fcntl function, file permissions- chmod, fchmod, file ownership-chown, lchown, fchown, links-soft links and hard links- symlink, link, unlink. Directories: Creating, removing and changing Directories-mkdir, rmdir, chdir, obtaining current working directory - getcwd, directory contents,scanning directories- opendir, readdir, rewin functions.

UNIT III

Process:

Process concept, Layout of a C program image in main memory, Process environment – environment list, environment variables, getenv, setenv, Kernel support for process, Process identification, Process

control - Process creation, replacing a process image, waiting for process, Process termination, Zombie process, Orphan process, ,system call interface for process management – fork, vfork, exit, wait, waitpid, exec family, process groups, sessions and controlling Terminal, differences between threads and processes. Signals: Introduction to signals, Signal generation, Signal handling, Kernel support for signals, signal function, Unreliable signals, Reliable signals, Signal functions: kill, raise, alarm, pause, abort, sleep.

UNIT IV

Interprocess Communication:

Introduction to IPC,IPC between processes on a single computer system, IPC between processes on different systems, Pipes - creationIPC between related processes using FIFOs(Named pipes), differences between unnamed and named pips, popen and pclose library functions. Message Queues: Kernel support for messages, APIs for message queues, Client/Server example Semaphores: Kernel support for semaphores, APIs for semaphores, file locking with semaphores.

UNIT V

Shared Memory:

Kernel support for Shared Memory, APIs for Shared Memory, Shared Memory example Sockets: Introduction to Berkley Sockets, IPC over a network, client – server model, Socket address structures (Unix domain and internet domain), Socket system calls for connection-oriented protocol and connectionless protocol, example- client/server programs- single server- client connection, multiple simultaneous clients, socket options - setsockopt and fcntl system calls, comparison of IPC mechanisms.

References:

1. Unix Shell Programming, by Yashavant Kanetkar, BPB Publications
2. Unix System Programming using C++, by T. Chan, PHI (Unit III to Unit VIII)
3. Unix Concepts and Applications, 4e, by Sumitabha Das, Tata McGraw Hill
4. Unix Network Programming, by W.R. Stevens, PHI
5. Beginning Linux Programming, 4e, by N. Matthew, R.Stones, Wrox, Wiley India Edition
6. Unix for Programmers 3e, by Graham Glass & King Ables, Pearson Education
7. System Programming with C and Unix, by A. Hoover, Pearson Education
8. Unix System Programming, Communication, Concurrency and Threads, by K.A. Robbins and S. Robbins, Pearson Education
9. Unix Shell Programming, by S.G. Kochan and P.Wood, 3rd edition, Pearson Education
10. Shell Scripting, by S. Parker, Wiley India Pvt. Ltd.
11. Advanced Programming in the Unix Environment, 2e, by W.R. Stevens, Pearson Education
12. Unix and Shell Programming, B.A. Forouzan & R.F. Gilberg, Cengage Learning
13. Linux System Programming, Robert Love, O'Reilly, SPD.

R.K.D.F. UNIVERSITY, BHOPAL
B.TECH (Computer Science and Engineering)
THIRD YEAR, Semester – V
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (CSE)	Lab (Python)	CS-5061	0L-0T-2P	2

Course Outcomes:

After completing this course satisfactorily, a student will be able to:

CO1 Write, Test and Debug Python Programs

CO2 Implement Conditionals and Loops for Python programs

CO3 Use functions and represent Compound data using Lists, Tuples and Dictionaries

Course Contents:

UNIT I

Introduction to Python Programming Language: Introduction to Python Language, Strengths and Weaknesses, IDLE, Dynamic Types, Naming Conventions, String Values, String Operations, String Slices, String Operators, Numeric Data Types, Conversions, Built In Functions

UNIT II

Data Collections and Language Component: Introduction, Control Flow and Syntax, Indenting, the if Statement, Relational Operators, Logical, Operators, True or False, Bit Wise Operators, The while Loop, break and continue, The for Loop, Lists, Tuples, Sets, Dictionaries, Sorting Dictionaries, Copying Collections.

UNIT III

Object and Classes: Classes in Python, Principles of Object Orientation, Creating Classes, Instance Methods, File Organization Special Methods, Class Variables, Inheritance, Polymorphism, Type Identification, Custom Exception Classes

UNIT IV

Functions and Modules: Introduction, Defining Your Own Functions, Parameters, Function Documentation, Keyword and Optional Parameters, Passing Collections to a Function, Variable Number of Arguments, Scope, Functions - "First Class Citizens", Passing Functions to a Function, Mapping Functions in a Dictionary, Lambda, Modules, Standard Modules – sys, Standard Modules – math, Standard Modules – time, The dir Function

UNIT V

I/O and Error Handling In Python: Introduction, Data Streams, Creating Your Own Data Streams, Access Modes, Writing Data to a File, Reading Data from a File, Additional File Methods, Using Pipes

as Data Streams, Handling IO Exceptions, Working with Directories, Metadata, Errors, Run Time Errors, The Exception Model, Exception Hierarchy, Handling Multiple Exceptions.

LIST OF EXPRIMENTS:

1. Running instructions in Interactive interpreter and a Python Script.
2. Write a program to purposefully raise Indentation Error and correct it.
3. Scientific problem-solving using decision making and looping.
4. Simple programming for one dimensional and two-dimensional arrays.
5. Python Programing to explore string functions.
6. Utilizing 'Functions' in Python
    a. Find mean, median, mode for the given set of numbers in a list.
    b. Write a function dups to find all duplicates in the list.
    c. Write a function unique to find all the unique elements of a list.
    d. Write function to compute gcd, lcm of two numbers
7. Demonstrate the use of Lists, Dictionaries.
8. Write a program to implement Turtle.
9. Building a Classical Data Structure using Python Programming.
10. Implement Searching Operations: Linear and Binary Search.
11. To sort the 'n' numbers using: Selection and Insertion Sort.
12. Find the most frequent words in a text read from a file.
13. Demonstrate Exceptions in Python.
14. Simulate elliptical orbits and bouncing ball using Pygame

References:

1. Python Programming Fundamentals 2e, Kent D. Lee, Springer
2. Automate the Boring Stuff with Python Paperback by Al Sweigart, No Starch Press
3. Intro to Python for Computer Science and Data Science: Learning to Program with AI, Big Data and The Cloud Paperback by Paul J. Deitel, Harvey M. Deitel, Pearson Education
4. Think Python 3rd Edition, 3e, by Allen Downey, O'Reilly Media
5. Let Us Python, by Yashavant Kanetkar, BPL Publications
6. Python Adventures for Young Coders - Explore the World of Programming, by Alaa Tharwat, Apress
7. Learning Python: Powerful Object-Oriented Programming 6e, by Mark Lutz, O'Reilly Media
8. Python Cookbook, by David M. Baezly, O'Reilly Media

R.K.D.F. UNIVERSITY, BHOPAL
B.TECH (Computer Science and Engineering)
THIRD YEAR, Semester – VI
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (CSE)	Machine Learning	CS-6011	4L-0T-2P	6

Course Outcomes:

After completing this course satisfactorily, a student will be able to:

CO1 Provide an understanding of the theoretical concepts of machine learning.

CO2 Learn the most cost-effective approaches to automated knowledge acquisition in emerging data-rich disciplines.

CO3 Focus on the theoretical understanding of machine learning methods, as well as their computational implications.

CO4 Prepare the research and industry application of machine learning techniques.

Course Contents:

UNIT I

Introduction: Machine Learning (ML), Types of ML, (Supervised, Unsupervised, Semi-supervised, Reinforcement Learning), Applications of ML, Differences from AI, Deep Learning, and Statistics, hypothesis space and inductive bias, evaluation, cross-validation, Dimensionality Reduction: Subset Selection, Shrinkage Methods, Partial Least Squares.

UNIT II

Clustering in Machine Learning: Types of Clustering Method: Partitioning Clustering, Distribution Model-Based Clustering, Hierarchical Clustering, Fuzzy Clustering. Birch Algorithm, CURE Algorithm. Gaussian Mixture Models and Expectation Maximization. Parameters estimations – MLE, MAP. Applications of Clustering.

UNIT III

Classification algorithm: - Logistic Regression, Decision Tree Classification, Neural Network, K-Nearest Neighbors (K-NN), Support Vector Machine, Naive Bayes (Gaussian, Multinomial, Bernoulli). Performance Measures: Confusion Matrix, Classification Accuracy, Classification Report: Precisions, Recall, F1 score and Support.

UNIT IV

Ensemble Learning and Random Forest: Introduction to Ensemble Learning, Basic Ensemble Techniques (Max Voting, Averaging, Weighted Average), Voting Classifiers, Bagging and Pasting,

Out-of-Bag Evaluation, Random Patches and Random Subspaces, Random Forests (Extra-Trees, Feature Importance), Boosting (AdaBoost, Gradient Boosting), Stacking.

UNIT V

Dimensionality Reduction: The Curse of Dimensionality, Main Approaches for Dimensionality Reduction (Projection, Manifold Learning) PCA: Preserving the Variance, Principal Components, Projecting Down to d Dimensions, Explained Variance Ratio, Choosing the Right Number of Dimensions, PCA for Compression, Randomized PCA, Incremental PCA. Kernel PCA: Selecting a Kernel and Tuning Hyper parameters. Learning Theory: PAC and VC model.

References:

1. Machine Learning, by Tom M. Mitchell, McGraw Hill Education
2. Hands-On Machine Learning with Scikit-Learn and Tensorflow: Concepts, Tools, and Techniques to Build Intelligent Systems, by Aurelien Geon, O'Reilly Media
3. Machine Learning in Action, by Peter Harrington, Manning
4. Real-World Machine Learning Paperback by Henrik Brink, Joseph W. Richards, Mark-Fetherolf, and Beau Cronin, Manning
5. Simplified Machine Learning by Pooja Sharma, BPB Publications
6. Advanced Machine Learning: Fundamentals and Algorithms by Amit Tyagi, Avinash Sharma, and Khushboo Tripathi, BPB Publications
7. Introduction to Machine Learning with Python: A Guide for Data Scientists, by Andreas Muller, O'Reilly Media

R.K.D.F. UNIVERSITY, BHOPAL
B.TECH (Computer Science and Engineering)
THIRD YEAR, Semester – VI
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (CSE)	Compiler Design	CS-6021	3L-1T-2P	6

Course Outcomes:

After completing this course satisfactorily, a student will be able to:

CO1 Understand the different phases of compiler.

CO2 Design lexical analyzer for a sample language.

CO3 Apply different parsing algorithms to develop the parsers for a given grammar.

CO4 Understand syntax-directed translation and run-time environment.

CO5 Learn to implement code optimization techniques and a simple code generator.

Course Contents:

UNIT I

INTRODUCTION TO COMPILERS: Structure of a compiler–Lexical Analysis–Role of Lexical Analyzer–Input Buffering–Specification of Tokens – Recognition of Tokens – Lex – Finite Automata – Regular Expressions to Automata–Minimizing DFA.

UNIT II

SYNTAX ANALYSIS: Role ofParser– Grammars– Error Handling– Context-free grammars – Writing a grammar–TopDown Parsing- General Strategies Recursive Descent Parser Predictive Parser-LL(1) Parser-Shift Reduce Parser-LRParser- LR(0) Item Construction of SLR Parsing Table-Introduction to LALR Parser-Error Handling and Recovery in Syntax Analyzer-YACC.

UNIT III

INTERMEDIATE CODE GENERATION: Syntax Directed Definitions, Evaluation Orders for Syntax Directed Definitions, Intermediate Languages: Syntax Tree, Three Address Code, Types and Declarations, Translation of Expressions, Type Checking.

UNIT IV

RUN-TIME ENVIRONMENT AND CODE GENERATION: Storage Organization, Stack Allocation Space, Access to Non-local Data on the Stack, Heap Management- Issues in Code Generation-Design of a simple Code Generator.

UNIT V

CODE OPTIMIZATION: Principal Sources of Optimization–Peep-hole optimization-DAG-Optimization of Basic Blocks- Global Data Flow Analysis- Efficient Data Flow Algorithm.

References:

1. Compilers: Principles, Techniques and Tools, 2e, by Alfred V. Aho, Monica S. Lam, Ravi Sethi, and Jeffrey D. Ullman. Pearson Education
2. Principles of Compiler Design, by Alfred V Aho and Jeffrey D. Ullman, Narosa Publishing house
3. Compiler Design in C by Allen I. Holub, PHI Learning Pvt. Ltd.
4. Compiler Design by K. Muneeswaran, Oxford University Press
5. Compiler Design: Analysis and Transformation by Helmut Seidl, Reinhard Wilhelm, and Sebastian Hack, Springer
6. Compiler Design by Santanu Chattopadhyay, PHI Learning Pvt. Ltd.
7. Principles of Compiler Design‖, by V. Raghavan, Tata McGraw Hill Education
8. Optimizing Compilers for Modern Architectures: A Dependence based Approach, by Randy Allen and Ken Kennedy, Morgan Kaufmann Publishers
9. Advanced Compiler Design and Implementation, by Steven S. Muchnick, Morgan Kaufmann (Elsevier)
10. Engineering a Compiler, by Keith D Cooper and Linda Torczon, Morgan Kaufmann (Elsevier)

R.K.D.F. UNIVERSITY, BHOPAL
B.TECH (Computer Science and Engineering)
THIRD YEAR, Semester – VI
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (CSE)	Artificial Intelligence	CS-6031(A)	4L-0T-0P	4

Course Outcomes:

After completing this course satisfactorily, a student will be able to:

CO1 Acquire the knowledge of basic artificial intelligence.

CO2 Acquire the knowledge of searching strategies of AI.

CO3 Acquire the knowledge of game playing techniques and planning of AI.

CO4 Understand the concept of statistical methods for reasoning and logic.

CO5 Acquire the knowledge of expert systems and other learning methods of AI.

Course Contents:

UNIT I

Introduction: Introduction to Artificial Intelligence (AI), Foundations of AI, History of AI, Real life examples of AI, Turing test for AI, AI techniques, Problem Solving- Formulating problems, problem types, states and operators, state space.

UNIT II

Search Techniques in AI: Search algorithms in AI, Types of AI search, Uninformed search, Informed search, heuristic functions, Depth first search, Breadth first search, Best first search, Hill climbing algorithm, A* algorithm, AO* algorithm, Iterative deepening A*(IDA), small memory A*(SMA).

UNIT III

Game Playing and Planning: Perfect decision game, imperfect decision game, evaluation function, alpha-beta pruning, Minimax search, Planning, Components of planning, Goal stack planning, partial order planning, planning in the blocks world, hierarchical planning, conditional planning.

UNIT IV

Reasoning and Logic: Probability and Bayes' Theorem, Bayesian networks, Dempster-Shafer theory, Representation, Inference, Propositional Logic, predicate logic (first order logic), logical reasoning, forward chaining, backward chaining.

UNIT V

Expert Systems and Other Learning Methods: Representation, Expert system shells, Knowledge acquisition, neural networks, reinforcement learning, genetic algorithm, natural language processing.

References:

1. Artificial Intelligence 3e by Elaine Rich, Kevin Knight, Shivashankar B Nair, Tata McGraw Hill
2. Artificial Intelligence A Modern Approach by Stuart Russell, Peter Norvig, Prentice Hall Series
3. A First Course in Artificial Intelligence by Deepak Khemani, Tata McGraw Hill
4. Grokking Artificial Intelligence Algorithms by RishalHurbans, Manning Pub.
5. Artificial Intelligence: Concepts and Applications, by Lavika Goel, Wiley
6. Artificial Intelligence for Dummies, by John Paul Mueller and Luca Massaron, Wiley
7. Fundamentals of Artificial Intelligence by K.R. Chowdhary, Springer
8. Artificial Intelligence, 3e, by Patrick Henry Winston, Pearson Education
9. Artificial Intelligence: Beyond Classical AI by Reema Thareja, Pearson Education

R.K.D.F. UNIVERSITY, BHOPAL
B.TECH (Computer Science and Engineering)
THIRD YEAR, Semester – VI
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (CSE)	Computer Graphics & Multimedia	CS-6031(B)	4L-0T-0P	4

Course Outcomes:

After completing this course satisfactorily, a student will be able to:

CO1 Understand the basics of computer graphics, different graphics systems and applications of computer graphics.

CO2 Render projected objects to naturalize the scene in 2D view and use of illumination models for this.

CO3 Implement various algorithms to scan, convert the basic geometrical primitives, transformations, area filling, clipping.

CO4 Define the fundamentals of animation, virtual reality and its related technologies.

CO5 Design an application with the principles of virtual reality.

Course Contents:

UNIT I

OUTPUT PRIMITIVES: Introduction - Line - Curve and Ellipse Drawing Algorithms – Attributes – Two-imensional Geometric Transformations – Two-Dimensional Clipping and Viewing.

UNIT II

THREE-DIMENSIONAL CONCEPTS: Three-Dimensional Object Representations – Three-Dimensional Geometric and Modeling Transformations – Three-Dimensional Viewing – Color models – Animation.

UNIT III

MULTIMEDIA SYSTEMS DESIGN: An Introduction – Multimedia applications – Multimedia System Architecture – Evolving technologies for Multimedia – Defining objects for Multimedia systems – Multimedia Data interface standards – Multimedia Databases.

UNIT IV

MULTIMEDIA FILE HANDLING: Compression & Decompression – Data & File Format standards – Multimedia I/O technologies – Digital voice and audio – Video image and animation – Full motion video – Storage and retrieval Technologies.

UNIT V

HYPERMEDIA: Multimedia Authoring & User Interface – Hypermedia messaging - Mobile Messaging – Hypermedia message component – Creating Hypermedia message – Integrated multimedia message standards – Integrated Document management – Distributed Multimedia Systems.

References:

1. Computer Graphics C Version, by Donald Hearn and M. Pauline Baker, Pearson Education
2. Schaum's Outline of Computer Graphics 2e, by Zhigang Xiang, Roy A. Plastock, McGraw Hill Education
3. Computer Graphics from Scratch: A Programmer's Introduction to 3D Rendering by Gabriel Gambetta, No Starch Press
4. Computer Graphics by Samit Bhattacharya, Oxford University Press
5. Computer Graphics: A Programming Approach 2e, by Steven Harrington, McGraw Hill Education
6. Computer Graphics, by Apurva A Desai, PHI Learning Pvt Ltd.
7. Computer Graphics: Algorithms and Implementations, by DP Mukherjee and Debasish Jana, PHI Learning Pvt Ltd.
8. Computer Graphics & Multimedia, by GS Baluja, Dhanpat Rai & Co.
9. Multimedia Systems and Design, by Prabat K Andleigh and Kiran Thakrar, PHI Learning Pvt Ltd.

R.K.D.F. UNIVERSITY, BHOPAL
B.TECH (Computer Science and Engineering)
THIRD YEAR, Semester – VI
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (CSE)	Advanced Computer Architecture	CS-6031(C)	4L-0T-0P	4

Course Outcomes:

After completing this course satisfactorily, a student will be able to:

CO1 Understand the performance and efficiency in advanced multiple-issue processors.

CO2 Understand symmetric shared-memory architectures and their performance.

CO3 Understand multiprocessor cache coherence using the directory based and snooping class of protocols.

CO4 Understand the various models to achieve memory consistency.

CO5 Understand the several advanced optimizations to achieve cache performance.

Course Contents:

UNIT I

Introduction: review of basic computer architecture, quantitative techniques in computer design, measuring and reporting performance.

UNIT II

CISC and RISC processors. Pipelining: Basic concepts, instruction and arithmetic pipeline, data hazards, control hazards, and structural hazards, techniques for handling hazards. Exception handling.

UNIT III

Pipeline optimization techniques. Compiler techniques for improving performance. Hierarchical memory technology: Inclusion, Coherence and locality properties; Cache memory organizations, Techniques for reducing cache misses; Virtual memory organization, mapping and management techniques, memory replacement policies.

UNIT IV

Instruction-level parallelism: basic concepts, techniques for increasing ILP, superscalar, super-pipelined and VLIW processor architectures. Array and vector processors. Multiprocessor architecture: taxonomy of parallel architectures.

UNIT V

Centralized shared-memory architecture: synchronization, memory consistency, interconnection networks. Distributed shared-memory architecture. Cluster computers. Non von Neumann architectures: data flow computers, reduction computer architectures, systolic architectures.

References:

1. Advanced Computer Architecture: Parallelism, Scalability, Programmability, by Kai Hwang and Naresh Jotwani, McGraw Hill Education
2. Computer Architecture: A Quantitative Approach, by John L. Hennessy and David A. Patterson, Morgan Kaufmann
3. Computer Architecture: Pipelined and Parallel Processor Design, by M. J. Flynn, Narosa Publishing House
4. Modern Processor Design: Fundamentals of Superscalar Processors, by John Paul Shen and Mikko H. Lipasti, Tata McGraw-Hill
5. Advanced Computer Architecture, by Smruti Ranjan Sarangi, McGraw Hill Education
6. Advanced Computer Architectures: A Design Space Approach by Dezso Sima, Terence Fountain and Peter Kacsuk, Pearson Education
7. Parallel Computers 2: Architecture, Programming and Algorithms by RW Hockney, CR Jesshope, CRC Prsess

R.K.D.F. UNIVERSITY, BHOPAL
B.TECH (Computer Science and Engineering)
THIRD YEAR, Semester – VI
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (CSE)	Pattern Recognition	CS-6041(A)	4L-0T-0P	4

Course Outcomes:

After completing this course satisfactorily, a student will be able to:

CO1 Understand basic concepts in pattern recognition

CO2 Gain knowledge about state-of-the-art algorithms used in pattern recognition research.

CO3 Understand pattern recognition theories, such as Bayes classifier, linear discriminant analysis.

CO4 Apply pattern recognition techniques to real-world problems such as document analysis and recognition.

CO5 Implement simple pattern classifiers, classifier combinations, and structural pattern recognizers.

Course Contents:

UNIT I

Introduction – Definitions, data sets for Pattern, Application Areas and Examples of pattern recognition, Design principles of pattern recognition system, Classification and clustering, supervised Learning, unsupervised learning and adaptation, Pattern recognition approaches, Decision Boundaries, Decision region, Metric spaces, distances.

UNIT II

Classification: introduction, application of classification, types of classification, decision tree, naïve bayes, logistic regression, support vector machine, random forest, K Nearest Neighbour Classifier and variants, Efficient algorithms for nearest neighbour classification, Different Approaches to Prototype Selection, Combination of Classifiers, Training set, test set, standardization and normalization.

UNIT III

Different Paradigms of Pattern Recognition, Representations of Patterns and Classes, Unsupervised Learning, Clustering: Criterion functions for clustering, Clustering Techniques: Iterative square -error partitional clustering – K means, hierarchical clustering, Cluster validation.

UNIT IV

introduction of feature extraction and feature selection, types of feature extraction, Problem statement and Uses, Algorithms - Branch and bound algorithm, sequential forward / backward selection algorithms, (l,r) algorithm.

UNIT V

Recent advances in Pattern Recognition, Structural PR, SVMs, FCM, Soft computing and Neuro-fuzzy techniques, and real-life examples, Histograms rules, Density Estimation, Nearest Neighbor Rule, Fuzzy classification.

References:

1. Pattern Classification, 2e, by Richard O. Duda, Peter E. Hart and David G. Stork, John Wiley
2. Pattern Recognition and Machine Learning, by CM Bishop, Springer
3. Pattern Recognition, 4e, by S. Theodoridis and K. Koutroumba, Academic Press
4. Pattern Recognition: Statistical, Structural and Neural Approaches, by Robert Schalkoff, John Wiley & Sons
5. Pattern Recognition: Techniques and Applications, by Rajjan Shinghal, Oxford University Press

R.K.D.F. UNIVERSITY, BHOPAL
B.TECH (Computer Science and Engineering)
THIRD YEAR, Semester – VI
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (CSE)	Internet of Things	CS-6041(B)	4L-0T-0P	4

Course Outcomes:

After completing this course satisfactorily, a student will be able to:

CO1 Understand the vision of IoT from a global context.

CO2 Understand the application of IoT.

CO3 Determine the Market perspective of IoT.

CO4 Use of Devices, Gateways and Data Management in IoT.

CO5 Building state of the art architecture in IoT.

Course Contents:

UNIT I

IoT and Web Technology - The Internet of Things Today, Time for Convergence, Towards the IoT Universe, Internet of Things Vision, IoT Strategic Research and Innovation Directions, IoT Applications, Future Internet Technologies, Infrastructure, Networks and Communication, Processes, Data Management, Security, Privacy & Trust, Device Level Energy Issues, IoT Related Standardization, Recommendations on Research Topics.

UNIT II

M2M to IoT – A Basic Perspective– Introduction, Some Definitions, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT, The international driven global value chain and global information monopolies.

M2M to IoT - An Architectural Overview– Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations.

UNIT III

IoT Architecture: State of the Art – Introduction, State of the art, Architecture Reference Model - Introduction, Reference Model and architecture, IoT reference Model,

IoT Reference Architecture - Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views.

UNIT IV

IoT Applications for Value Creations - Introduction, IoT applications for industry: Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications, Four Aspects in your Business to

Master IoT, Value Creation from Big Data and Serialization, IoT for Retailing Industry, IoT For Oil and Gas Industry, Opinions on IoT Application and Value for Industry, Home Management, eHealth.

UNIT V

Internet of Things Privacy, Security and Governance: Introduction, Overview of Governance, Privacy and Security Issues, Contribution from FP7 Projects, Security, Privacy and Trust in IoT-Data-Platforms for Smart Cities, First Steps Towards a Secure Platform, Smartie Approach. Data Aggregation for the IoT in Smart Cities, Security

References:

1. Internet of Things (IoT): Architecture and Design Principles 2e, by Raj Kamal, McGraw Hill Education
2. Internet of Things, by Jeeva Jose, Khanna Book Publishing
3. Internet of Things (IoT) & Its Applications, by Satish Jain and Shashi Singh, BPB Publications
4. Internet of Things: Architecture, Implementation and Security, by Mayur Ramgir, Pearson Education
5. Internet of Things by Srinivasa K. G., Siddesh G. M., Hanumantha Raju R., Cengage Learning Pvt. Ltd.
6. Internet of Things by Surya Durbha, Jyoti Joglekar, Oxford University Press
7. Internet of Things A Hands-on-Approach, by Vijay Madisetti and Arshdeep Bahga, University Press
8. Getting Started with the Internet of Things, by Cuno Pfister, O'Reilly Media

R.K.D.F. UNIVERSITY, BHOPAL
B.TECH (Computer Science and Engineering)
THIRD YEAR, Semester – VI
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (CSE)	Wireless and Mobile Computing	CS-6041(C)	4L-0T-0P	4

Course Outcomes:

After completing this course satisfactorily, a student will be able to:

CO1 Understand fundamentals of wireless communications.

CO2 Analyze security, energy efficiency, mobility, scalability, and their unique characteristics in wireless networks.

CO3 Demonstrate basic skills for cellular networks design.

CO4 Apply knowledge of TCP/IP extensions for mobile and wireless networking.

CO5 Understand fundamentals of wireless communications.

Course Contents:

UNIT I

Antenna, variation pattern, antenna types, antenna gain, propagation modes, types of fading. Model for wireless digital communication, multiple access technique-SDMA, TDMA, FDMA, CDMA, DAMA, PRMA, MAC/CA, Cellular network organization, operations of cellular system, mobile radio propagation effects, handoff, power control, sectorization, traffic engineering, Infinite sources, lost calls cleared, grade of service, poison arrival process

UNIT II

GSM- Services, system architecture, radio interface, logical channels, protocols, localization and calling, handover, security, HSCSD, GPRS-architecture, Interfaces, Channels, mobility management DECT, TETRA, UMTS.

UNIT III

IEEE 802.11: LAN-architecture, 802.11 a, b and g, protocol architecture, physical layer, MAC layer, MAC management, HIPERLAN-protocol architecture, physical layer, access control sub layer, MAC sub layer. Bluetooth-user scenarios- physical layer, MAC layer.

UNIT IV

Mobile IP, DHCP, Ad hoc networks: Characteristics, performance issue, routing in mobile host. Wireless sensor network, Mobile transport layer: Indirect TCP, Snooping TCP, Mobile TCP, Time out freezing, Selective retransmission, transaction-oriented TCP. Introduction to WAP.

UNIT V

Intruders, Intrusion detection, password management, viruses and related threads, worms, trojan horse defense, difference biometrics and authentication system, firewall design principle.

References:

1. Wireless Communications 2e, by Theodore S. Rappaport, Pearson Education
2. Wireless Communications and Networking by Mark, Zhuang, Pearson Education
3. Wireless Communication, by Upen Dalal, Oxford University Press
4. Mobile Communication, by J. Schiller, Addision Wiley
5. Wireless Communication and Network, by William Stallings, Pearson Education
6. Wireless Digital communication, by Kamilo Feher, PHI Learning Pvt Ltd.
7. Mobile Communication Design Fundamental, by William C.Y Lee, John Wiley
8. Wireless Communications and Networking, by Vijay Garg, Morgan Kaufmann
9. Principles of Modern Wireless Communication Systems Theory and Practice, by Aditya K. Jagannatham, McGraw Hill Education

R.K.D.F. UNIVERSITY, BHOPAL
B.TECH (Computer Science and Engineering)
THIRD YEAR, Semester – VI
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (CSE)	Data Analytics Lab	CS-6051	0L-0T-2P	2

Course Outcomes:

After completing this course satisfactorily, a student will be able to:

CO1 Understand the basics of software as a product.

CO2 List the components of Hadoop and Hadoop Eco-System.

CO3 Access and Process Data on Distributed File System.

CO4 Manage Job Execution in Hadoop Environment.

CO5 Develop Big Data Solutions using Hadoop Eco System.

Course Contents:

UNIT I

Basics of data analytic framework, data per-processing, Statistics, probability, Probability Distribution, Bayes' Theorem, Central Limit theorem, Data Exploration & preparation, Concepts of Correlation, Regression, Covariance, Outliers, Data visualization.

UNIT II

Introduction to R as a data analytics tool.

UNIT III

Introduction to MATLAB as a data analytics tool.

UNIT IV

Introduction to python as a data analytics tool.

UNIT V

Case studies.

R.K.D.F. UNIVERSITY, BHOPAL
B.TECH (Computer Science and Engineering)
THIRD YEAR, Semester – VI
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (CSE)	Skill Development Lab	CS-6061	0L-0T-2P	2

Course Outcomes:

After completing this course satisfactorily, a student will be able to:

CO1 Understand the basics of software as a Product.

CO2 Understand the current requirements of industries.

CO3 Implement the software as a product using different design patterns.

CO4 Apply the software development techniques in real life applications.

Course Contents:

UNIT I

Software product life cycle.

UNIT II

Software product development standards.

UNIT III

Design patterns – 1

UNIT IV

Design Patterns – II

UNIT V

Case Study

R.K.D.F. UNIVERSITY, BHOPAL
B.TECH (Computer Science and Engineering)
FOURTH YEAR, Semester – VII
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (CSE)	Data Mining and Warehousing	CS-7011	2L-1T-1P	4

Course Outcomes:

After completing this course satisfactorily, a student will be able to:

CO1 Understand the need of designing Enterprise data warehouses.

CO2 Compare and contrast, various methods for storing & retrieving data from different data sources/repository.

CO3 Ascertain the application of data mining in various areas and preprocess the given data and visualize it for a given application or data exploration/mining task.

CO4 Apply data mining approach to business problems analytically by identifying opportunities to derive business.

Course Contents:

UNIT I

Data Warehousing: Introduction, Delivery Process, Data warehouse Architecture, Data Preprocessing: Data cleaning, Data Integration and transformation, Data reduction. Data warehouse Design: Datawarehouse schema, Partitioning strategy Data warehouse Implementation, Data Marts, Meta Data, Example of a Multidimensional Data model. Introduction to Pattern Warehousing.

UNIT II

OLAP Systems: Basic concepts, OLAP queries, Types of OLAP servers, OLAP operations etc. Data Warehouse Hardware and Operational Design: Security, Backup and Recovery

UNIT III

Introduction to Data & Data Mining: Data Types, Quality of data, Data Preprocessing, Similarity measures, Summary statistics, Data distributions, Basic data mining tasks, Data Mining V/s knowledge discovery in databases. Issues in Data mining. Introduction to Fuzzy sets and fuzzy logic.

UNIT IV

Supervised Learning: Classification: Statistical-based algorithms, Distance-based algorithms, Decision tree-based algorithms, Neural network-based algorithms, Rule-based algorithms, Probabilistic Classifiers

UNIT V

Clustering & Association Rule mining: Hierarchical algorithms, Partitional algorithms, Clustering large databases – BIRCH, DBSCAN, CURE algorithms.Association rules : Parallel and distributed algorithms such as Apriori and FP growth algorithms.

References:

1. Data Mining: Concepts and Techniques, by Jaiwei Han, Micheline Kamber, and Jian Pei, Morgan Kaufmann (Elsevier)
2. Introduction to Data Mining, 2e, by Pang-Ning Tan, Michael Steinbach, Vipin Kumar, Anuj Karpatne, Pearson Education
3. Data Mining: Practical Machine Learning Tools and Techniques 4e, by Ian H. Witten, Eibe Frank, Mark A. Hall, Christopher J. Pal, Morgan Kaufmann
4. Data Mining and Data Warehousing: Principles and Practical Techniques by Parteek Bhatia, Cambridge University Press
5. Modern Data Mining with Python: A Risk-Managed Approach to Developing and Deploying Explainable and Efficient Algorithms using ModelOps by Dushyant Singh Sengar, Vikash Chandra, BPB Publications
6. Data Mining: Introductory and Advanced Topics by Margaret H. Dunham, Pearson Education
7. Data Warehousing in the Real World, by Anahory and Murray, Pearson Education

R.K.D.F. UNIVERSITY, BHOPAL
B.TECH (Computer Science and Engineering)
FOURTH YEAR, Semester – VII
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (CSE)	Computational Intelligence	CS-7021(A)	3L-1T-0P	4

Course Outcomes:

After completing this course satisfactorily, a student will be able to:

CO1 Describe in-depth about theories, methods, and algorithms in computation Intelligence.

CO2 Compare and contrast traditional algorithms with nature inspired algorithms.

CO3 Examine the nature of a problem at hand and determine whether a computation intelligent technique/algorithm can solve it efficiently enough.

CO4 Design and implement Computation Intelligence algorithms and approaches for solving real-life problems.

Course Contents:

UNIT I

Introduction to Computational Intelligence; types of Computational Intelligence, components of Computational Intelligence. Concept of Learning/Training model. Parametric Models, Nonparametric Models. Multilayer Networks: Feed Forward network, Feedback network.

UNIT II

Fuzzy Systems: Fuzzy set theory: Fuzzy sets and operations, Membership Functions, Concept of Fuzzy relations and their composition, Concept of Fuzzy Measures; Fuzzy Logic: Fuzzy Rules, Inferencing; Fuzzy Control - Selection of Membership Functions, Fuzzyfication, Rule Based Design & Inferencing, Defuzzyfication.

UNIT III

Genetic Algorithms: Basic Genetics, Concepts, Working Principle, Creation of Offsprings, Encoding, Fitness Function, Selection Functions, Genetic Operators-Reproduction, Crossover, Mutation; Genetic Modeling, Benefits.

UNIT IV

Rough Set Theory - Introduction, Fundamental Concepts, Set approximation, Rough membership, Attributes, Optimization. Hidden Markov Models, Decision tree model.

UNIT V

Introduction to Swarm Intelligence, Swarm Intelligence Techniques: Ant Colony Optimization, Particle Swarm Optimization, Bee Colony Optimization etc. Applications of Computational Intelligence.

References:

1. Computational Intelligence: Concepts to Implementations, by Russell C. Eberhart and Yuhui Shi, Morgan Kaufmann Publishers
2. Computational Intelligence: An Introduction, by Andries P. Engelbrecht, Wiley Publishing
3. Neural Networks: A Comprehensive Foundation, by Simon Haykin, Prentice Hall
4. Genetic Algorithm in Search Optimization and Machine Learning, by David E. Goldberg, Pearson Education.
5. Evolutionary and Swarm Intelligence Algorithms, by Jagdish Chand Bansal, Pramod Kumar Singh, Nikhil R. Pal, Springer
6. Neural Networks, Fuzzy Logic, Genetic Algorithms Synthesis and Applications, by S. Rajeskaran, G.A. VijaylakshmiPai, PHI Learning Pvt. Ltd.
7. Neuro-Fuzzy and Soft Computing: A Computational Approach to Learning & Machine Intelligence, by J.S. Roger Jang, C.T.Sun, E. Mizutani, PHI Learning Pvt. Ltd.

R.K.D.F. UNIVERSITY, BHOPAL
B.TECH (Computer Science and Engineering)
FOURTH YEAR, Semester – VII
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (CSE)	Deep and Reinforcement Learning	CS-7021(B)	3L-1T-0P	4

Course Outcomes:

After completing this course satisfactorily, a student will be able to:

CO1 Describe in-depth about theories, models and algorithms in machine learning.

CO2 Compare and contrast different learning algorithms with parameters.

CO3 Examine the nature of a problem at hand and find the appropriate learning algorithms and it's parameters that can solve it efficiently enough.

CO4 Design and implement of deep and reinforcement learning approaches for solving real-life problems.

Course Contents:

UNIT I

History of Deep Learning, McCulloch Pitts Neuron, Thresholding Logic, Activation functions, Gradient Descent (GD), Momentum Based GD, Nesterov Accelerated GD, Stochastic GD, AdaGrad, RMSProp, Adam, Eigenvalue Decomposition. Recurrent Neural Networks, Backpropagation through time (BPTT), Vanishing and Exploding Gradients, Truncated BPTT, GRU, LSTMs, Encoder Decoder Models, Attention Mechanism, Attention over images.

UNIT II

Autoencoders and relation to PCA, Regularization in autoencoders, Denoising autoencoders, Sparse autoencoders, Contractive autoencoders, Regularization: Bias Variance Tradeoff, L2 regularization, Early stopping, Dataset augmentation, Parameter sharing and tying, Injecting noise at input, Ensemble methods, Dropout, Batch Normalization, Instance Normalization, Group Normalization.

UNIT III

Greedy Layer-wise Pre-training, Better activation functions, Better weight initialization methods, Learning Vectorial Representations Of Words, Convolutional Neural Networks, LeNet, AlexNet, ZF-Net, VGGNet, GoogLeNet, ResNet, Visualizing Convolutional Neural Networks, Guided Backpropagation, Deep Dream, Deep Art, Recent Trends in Deep Learning Architectures.

UNIT IV

Introduction to reinforcement learning (RL), Bandit algorithms – UCB, PAC, Median Elimination, Policy Gradient, Full RL & MDPs, Bellman Optimality, Dynamic Programming - Value iteration,

Policy iteration, and Q-learning & Temporal Difference Methods, Temporal-Difference Learning, Eligibility Traces, Function Approximation, Least Squares Methods

UNIT V

Fitted Q, Deep Q-Learning, Advanced Q-learning algorithms, learning policies by imitating optimal controllers, DQN & Policy Gradient, Policy Gradient Algorithms for Full RL, Hierarchical RL, POMDPs, Actor-Critic Method, Inverse reinforcement learning, Maximum Entropy Deep Inverse Reinforcement Learning, Generative Adversarial Imitation Learning, Recent Trends in RL Architectures.

References:

1. Deep Reinforcement Learning in Action, by Alexander Zai and Brandon Brown, Manning
2. Grokking Deep Reinforcement Learning, by Miguel Morales, Manning
3. Deep Reinforcement Learning Hands-On, by Maxim Lapan, Packt Publishing Ltd.
4. Practical Deep Reinforcement Learning with Python, by Ivan Gridin, BPB Publication
5. Deep Reinforcement Learning, by Aske Plaat. Springer
6. Reinforcement Learning, by Richard S. Sutton, Penguin Random House
7. An Introduction to Reinforcement Learning, by Soumyadip Sarkar, Notion Press
8. Reinforcement Learning: Industrial Applications of Intelligent Agents, by Phil Winder, O'Reilly Media
9. Mastering Reinforcement Learning with Python, by Enes Bilgin, Packt Publishing Ltd.
10. Algorithms for Reinforcement Learning, by Csaba Grossi, Springer
11. Foundations of Deep Reinforcement Learning: Theory and Practice in Python, by Laura Graesser and Wah Loon Keng, Pearson Education
12. Reinforcement Learning, by Richard S. Sutton, Andrew G. Barto, Bradford Books

R.K.D.F. UNIVERSITY, BHOPAL
B.TECH (Computer Science and Engineering)
FOURTH YEAR, Semester – VII
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (CSE)	Big Data	CS-7021(C)	3L-1T-0P	4

Course Outcomes:

After completing this course satisfactorily, a student will be able to:

CO1 Students should be able to understand the concept and challenges of big data.

CO2 Students should be able to demonstrate knowledge of big data analytics.

CO3 Students should be able to develop Big Data Solutions using Hadoop Eco System.

CO4 Students should be able to gain hands-on experience on large-scale analytics tools.

Course Contents:

UNIT I

Introduction to Big data, Big data characteristics, Types of big data, Traditional versus Big data, Evolution of Big data, challenges with Big Data, Technologies available for Big Data, Infrastructure for Big data, Use of Data Analytics, Desired properties of Big Data system.

UNIT II

Introduction to Hadoop, Core Hadoop components, Hadoop Eco system, Hive Physical Architecture, Hadoop limitations, RDBMS Versus Hadoop, Hadoop Distributed File system, Processing Data with Hadoop, Managing Resources and Application with Hadoop YARN, MapReduce programming.

UNIT III

Introduction to Hive Hive Architecture, Hive Data types, Hive Query Language, Introduction to Pig, Anatomy of Pig, Pig on Hadoop, Use Case for Pig, ETL Processing, Data types in Pig running Pig, Execution model of Pig, Operators, functions, Data types of Pig.

UNIT IV

Introduction to NoSQL, NoSQL Business Drivers, NoSQL Data architectural patterns, Variations of NOSQL architectural patterns using NoSQL to Manage Big Data, Introduction to MangoDB.

UNIT V

Mining social Network Graphs: Introduction Applications of social Network mining, Social Networks as a Graph, Types of social Networks, Clustering of social Graphs Direct Discovery of communities in a social graph, Introduction to recommender system.

References:

1. Big Data: Principles and Best Practices of Scalable Real-Time Data Systems, by Nathan Marz and James Warren, Manning
2. Introducing Data Science: Big Data, Machine Learning, and More, Using Python Tools by Davy Cielen, Arno D.B. Meysman and Mohamed Ali, Manning
3. Big Data Analytics, by Raj Kamal, Preeti Saxena, McGraw Hill Education
4. Big Data Analytics 2e, by RadhaShankarmani, M. Vijaylakshmi, Wiley
5. Big Data with Hadoop MapReduce: A Classroom Approach, by Anand Paul, Ganeshkumar Pugalendhi and Rathinaraja Jeyaraj, CRC Press
6. Big Data and Analytics: The key concepts and practical applications of big data analytics, by Jugnesh Kumar, Anubhav Kumar and Rinku Kumar, BPB Publications
7. Big Data Analytics: Concepts, Techniques, Tools and Technologies, by G. Sudha, M. Thangaraj and S. Suguna, PHI Learning Pvt. Ltd.
8. Big Data and Analytics, 2e, by Seema Acharya and Subhashini Chellappan, Wiley
9. Big Data Big Analytics, by Michael Minelli, Michele Chambers and AmbigaDhiraj, Wiley

R.K.D.F. UNIVERSITY, BHOPAL
B.TECH (Computer Science and Engineering)
FOURTH YEAR, Semester – VII
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (CSE)	Cryptography and Information Security	CS-7031(A)	3L-0T-0P	3

Course Outcomes:

After completing this course satisfactorily, a student will be able to:

CO1 Understanding of the basics of Cryptography and Network Security and working knowledge of Mathematics used in Cryptology.

CO2 Understanding of previous attacks on cryptosystems to prevent future attacks from securing a message over an insecure channel by various means.

CO3 Knowledge about how to maintain the Confidentiality, Integrity and Availability of a data.

CO4 Understanding of various protocols for network security to protect against the network threats.

CO5 Getting hands-on experience of various Information Security Tools.

Course Contents:

UNIT I

Mathematical Background for Cryptography: Abstract Algebra, Number Theory, Modular Inverse, Extended Euclid Algorithm, Fermat's Little Theorem, Euler Phi-Function, Euler's theorem. Introduction to Cryptography: Principles of Cryptography, Classical Cryptosystem, Cryptanalysis on Substitution Cipher (Frequency Analysis), Play Fair Cipher, Block Cipher. Data Encryption Standard (DES), Triple DES, Modes of Operation, Stream Cipher.

UNIT II

Advanced Encryption Standard (AES), Introduction to Public Key Cryptosystem, Discrete Logarithmic Problem, Diffie-Hellman Key Exchange Computational & Decisional Diffie-Hellman Problem, RSA Assumptions & Cryptosystem, RSA Signatures & Schnorr Identification Schemes, Primarily Testing, Elliptic Curve over the Reals, Elliptic curve Modulo a Prime., Chinese Remainder Theorem.

UNIT III

Message Authentication, Digital Signature, Key Management, Key Exchange, Hash Function. Universal Hashing, Cryptographic Hash Function, MD, Secure Hash Algorithm (SHA), Digital Signature Standard (DSS), Cryptanalysis: Time-Memory Trade-off Attack, Differential Cryptanalysis. Secure channel and authentication system like Kerberos.

UNIT IV

Information Security: Threats in Networks, Network Security Controls–Architecture, Wireless Security, Honey pots, Traffic Flow Security, Firewalls – Design and Types of Firewalls, Personal Firewalls, IDS, Email Security: Services Security for Email Attacks Through Emails, Privacy-Authentication of Source Message, Pretty Good Privacy (PGP), S-MIME. IP Security: Overview of IPSec, IP& IP version 6 Authentication, Encapsulation, Security Payload ESP, Internet Key Exchange IKE, Web Security: SSL/TLS, Basic protocols of security. Encoding –Secure Electronic Transaction SET.

UNIT V

Cryptography and Information Security Tools: Spoofing tools: like Arping etc., Foot printing Tools (ex- nslookup, dig, Whois etc..), Vulnerabilities Scanning Tools (i.e. Angry IP, HPing2, IP Scanner, Global Network Inventory Scanner, Net Tools Suite Pack.), NetBIOS Enumeration Using NetView Tool, Steganography Merge Streams, Image Hide, Stealth Files, Blindsideusing: STools, Steghide, Steganos. Stegdetect, Steganalysis - Stego Watch - Stego Detection Tool, StegSpy. Trojans Detection Tools (i.e. Netstat, fPort, TCPView, CurrPorts Tool, Process Viewer), Lan Scanner Tools (i.e.look@LAN, Wireshark, Tcpdump). DoS Attack Understanding Tools- Jolt2, Bubonic.c, Land and LaTierra, Targa, Nemesy Blast, Panther2, Crazy Pinger, Some Trouble, UDP Flood, FSMax.

References:

1. Cryptography and Network Security Principles and Practice 4e, by William Stallings, Pearson Education
2. Cryptography and Network Security, by Behrouz A Ferouzan, Tata McGraw Hill
3. Network Security Essentials: Applications and Standards, by William Stallings. Prentice Hall
4. Security in Computing, 4e, by Charles P. Pfleeger, Shari Lawrence Pfleeger, Prentice Hall of India
5. Introduction to Modern Cryptography by Jonathan Katz and Yehuda Lindell, Chapman and Hall/CRC Press
6. Cryptography and Network Security 4e, by Atul Kahate, McGraw Hill Education
7. Foundations of Cryptography: Volume 1, Basic Tools, by Oded Goldreich. Cambridge University Press
8. Understanding Cryptography: A Textbook for Students and Practitioners, by Bart Preneel, Christof Paar and Jan Pelzl, Springer
9. Real-World Cryptography, by David Wong, Manning
10. Cryptography and Network Security, by Savita Gandhi and Bhushan Trivedi, BPB Publications

R.K.D.F. UNIVERSITY, BHOPAL
B.TECH (Computer Science and Engineering)
FOURTH YEAR, Semester – VII
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (CSE)	Software Architecture	CS-7031(B)	2L-1T-1P	4

Course Outcomes:

After completing this course satisfactorily, a student will be able to:

CO1 Describe the Fundamentals of software architecture, qualities and terminologies.

CO2 Understand the fundamental principles and guidelines for software architecture design, architectural styles, patterns, and frameworks.

CO3 Use implementation techniques of Software architecture for effective software development.

CO4 Apply core values and principles of software architectures for enterprise application development.

Course Contents:

UNIT I

Overview of Software development methodology and software quality model, different models of software development and their issues. Introduction to software architecture, evolution of software architecture, software components and connectors, common software architecture frameworks, Architecture business cycle – architectural patterns – reference model.

UNIT II

Software architecture models: structural models, framework models, dynamic models, process models. Architectures styles: dataflow architecture, pipes and filters architecture, call-and return architecture, data - centered architecture, layered architecture, agent-based architecture, Micro-services architecture, Reactive Architecture, Representational state transfer architecture etc.

UNIT III

Software architecture implementation technologies: Software Architecture Description Languages (ADLs), Struts, Hibernate, Node JS, Angular JS, J2EE – JSP, Servlets, EJBs; middleware: JDBC, JNDI, JMS, RMI and CORBA etc. Role of UML in software architecture.

UNIT IV

Software Architecture analysis and design: requirements for architecture and the life-cycle view of architecture design and analysis methods, architecture-based economic analysis: Cost Benefit Analysis Method (CBAM), Architecture Tradeoff Analysis Method (ATAM). Active Reviews for Intermediate Design (ARID), Attribute Driven Design method (ADD), architecture reuse, Domain –specific Software architecture.

UNIT V

Software Architecture documentation: principles of sound documentation, refinement, context diagrams, variability, software interfaces. Documenting the behavior of software elements and software systems, documentation package using a seven-part template.

References:

1. Software Architecture in Practice, 2e, by Bass, L., P. Clements, and R. Kazman, Prentice Hall
2. Software Architecture: Organizational Principles and Practices, by Dikel, David, D. Kane, and J. Wilson, Prentice Hall
3. Evaluating Software Architectures: Methods and Case Studies, by Clements, Paul, R. Kazman, M. Klein, Addison Wesley
4. Software Architecture and Design: Principles, Models and Methods, by Witt, B., T. Baker and E. Meritt, Nostrand Reinhold
5. The Art of Software Architecture, by S. Albin, Indiana: Wiley
6. Patterns of Enterprise Application Architecture, by Robert Mee, and Randy Stafford, Addison-Wesley
7. Designing Hard Software: The Essential Tasks, by Bennett, Douglas, Prentice Hall

R.K.D.F. UNIVERSITY, BHOPAL
B.TECH (Computer Science and Engineering)
FOURTH YEAR, Semester – VII
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (CSE)	Disaster Management	CS-7031(C)	3L-0T-0P	3

Course Outcomes:

After completing this course satisfactorily, a student will be able to:

CO1 Gain a preliminary understanding fundamental concepts, types, and phases of disasters and disaster risk reduction.

CO2 Analyze the causes and impacts of natural and man-made disasters at local, national, and global levels.

CO3 Demonstrate knowledge of disaster preparedness, mitigation strategies, and emergency response mechanisms.

CO4 Evaluate the role of various stakeholders including government agencies, NGOs, and international bodies in disaster management.

CO5 Apply principles of disaster risk assessment, early warning systems, and community-based disaster management.

Course Contents:

UNIT I

INTRODUCTION TO DISASTERS

Definition: Disaster, Hazard, Vulnerability, Resilience, Risks – Disasters: Types of disasters – Earthquake, Landslide, Flood, Drought, Fire etc - Classification, Causes, Impacts including social, economic, political, environmental, health, psychosocial, etc.- Differential impacts- in terms of caste, class, gender, age, location, disability - Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change – Dos and Dont's during various types of Disasters.

UNIT II

APPROACHES TO DISASTER RISK REDUCTION

Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- non-structural measures, Roles and responsibilities of- community, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stake-holders- Institutional Processes and Framework at State and Central Level- State Disaster Management Authority (SDMA) – Early Warning System – Advisories from Appropriate Agencies.

UNIT III

INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT

Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc.- Climate Change Adaptation- IPCC Scenario and Scenarios in the context of India - Relevance of indigenous knowledge, appropriate technology and local resources

UNIT IV

DISASTER RISK MANAGEMENTININDIA

Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy - Other related policies, plans, programmes and legislation – Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment

UNIT V

DISASTER MANAGEMENT: APPLICATIONS AND CASE STUDIES AND FIELD WORKS

Landslide Hazard Zonation: Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding: Case Studies; Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.

References:

1. Disaster Management, by JP Singhal, Laxmi Publications
2. Disaster Science and Management, by Tushar Bhattacharya, McGraw Hill Education
3. Disaster Management, 2e, by Mrinalini Pandey, Wiley
4. Disaster Management, by MM Sulphey, PHI Learning Pvt. Ltd.

R.K.D.F. UNIVERSITY, BHOPAL
B.TECH (Computer Science and Engineering)
FOURTH YEAR, Semester – VII
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (CSE)	Cloud Computing	CS-8011	2L-1T-1P	4

Course Outcomes:

After completing this course satisfactorily, a student will be able to:

CO1 Understand the concepts, characteristics, delivery models and benefits of cloud computing.

CO2 Understand the key security and compliance challenges of cloud computing.

CO3 Understand the key technical and organisational challenges.

CO4 Understand the different characteristics of public, private and hybrid cloud deployment models.

Course Contents:

UNIT I

Introduction:

Historical development, Vision of Cloud Computing, Characteristics of cloud computing as per NIST, Cloud computing reference model, Cloud computing environments, Cloud services requirements, Cloud and dynamic infrastructure, Cloud Adoption and rudiments. Overview of cloud applications: ECG Analysis in the cloud, Protein structure prediction, Gene Expression Data Analysis, Satellite Image Processing, CRM and ERP, Social networking.

UNIT II

Cloud Computing Architecture:

Cloud Reference Model, Types of Clouds, Cloud Interoperability & Standards, Scalability and Fault Tolerance, Cloud Solutions: Cloud Ecosystem, Cloud Business Process Management, Cloud Service Management. Cloud Offerings: Cloud Analytics, Testing Under Control, Virtual Desktop Infrastructure

UNIT III

Cloud Management & Virtualization Technology:

Resiliency, Provisioning, Asset management, Concepts of Map reduce, Cloud Governance, High Availability and Disaster Recovery. Virtualization: Fundamental concepts of compute, storage, networking, desktop and application virtualization. Virtualization benefits, server virtualization, Block and file level storage virtualization Hypervisor management software, Infrastructure Requirements, Virtual LAN (VLAN) and Virtual SAN (VSAN) and their benefits.

UNIT IV

Cloud Security:

Cloud Information security fundamentals, Cloud security services, Design principles, Secure Cloud Software Requirements, Policy Implementation, Cloud Computing Security Challenges, Virtualization security Management, Cloud Computing Security Architecture.

UNIT V

Market Based Management of Clouds, Federated Clouds/Inter Cloud: Characterization and Definition, Cloud Federation Stack, Third Party Cloud Services. Case study: Google App Engine, Microsoft Azure, Hadoop, Amazon, Aneka

References:

1. Mastering Cloud Computing 2e, by Rajkumar Buyya, Christian Vecciola, Thamarai Selvi, Shivananda Poojara and Satish N. Srirama, McGraw Hill Education
2. Cloud Computing, by Shailendra Singh, Oxford University Press
3. Cloud Computing for Everyone: Understanding Principles, Architecture, Security, Data, and Green Practices, by Rohit Agarwal, and Dilip K Prasad, BPB Publications
4. Cloud Computing: Concepts, Technology, Security & Architecture, 2e, by Thomas Erl and Eric Barceló Monroy, Pearson Education
5. Cloud Computing: A Practical Approach, by Toby Velte, Anthony Velte and Robert Elsenpeter, McGraw Hill Education
6. Cloud Computing: A Hands-On Approach, by Arshdeep Bahga and Vijay Madisetti, The Orient Blackswan
7. Cloud Computing Bible, by Barrie Sosinsky, Wiley
8. Cloud Computing: Architecting Next-Gen Transformation Paradigms, 4e, by Kumar Saurabh, Wiley

R.K.D.F. UNIVERSITY, BHOPAL
B.TECH (Computer Science and Engineering)
FOURTH YEAR, Semester – VII
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (CSE)	High Performance Computing	CS-8021(A)	3L-1T-0P	4

Course Outcomes:

After completing this course satisfactorily, a student will be able to:

CO1 Design, formulate, solve and implement high performance versions of standard single threaded algorithms.

CO4 Able to

CO2 Use HPC platforms and parallel programming models.

CO3 Measure, analyse and assess the performance of HPC applications and their supporting hardware.

CO4 Do administration, scheduling, code portability and data management in an HPC environment, with particular reference to Grid Computing.

Course Contents:

UNIT I

Introduction to modern processors-: General Purpose cache-based architecture performance metric and bench marks, Moors Law, pipelining, super clarity, SIMD. Memory Hierarchies, Multi core processors, multi-threaded processors, Vector processors- Design principle, Max performance estimates, programming for vector architecture. Basic Optimizations for serial codes - Scalar profiling, common sense optimizations, Simple measures and their impacts, role of compilers, C++ optimizations.

UNIT II

Data access optimizations: balance analysis and light speed estimates, storage order, Algorithm classifications and assess optimizations, case studies for data access optimizations. Parallel Computers: Shared memory computers, Distributed memory computers, hybrid systems, Network computers.

UNIT III

Basics of parallel computing: data and functional parallelism, parallel scalability- laws, metrics, factors, efficiency and load imbalance. Shared memory parallel programming with Open MP: Parallel execution, data scoping, work sharing using loops, synchronization, Reductions, loop scheduling and Tasking.

UNIT IV

Efficient Open MP Programming: Program profiling, Performance pitfalls, improving the impact of open MP work sharing constructs, determining overheads for short loops, serialization and false sharing.

UNIT V

Distributed Memory parallel programming with MPI: Message passing, Message and point to point communication, collective communication, non-blocking point-to-point communication, virtual topologies. Efficient MPI Programming: MPI performance tools, communication parameters, impact of synchronizations sterilizations and contentions, reductions in communication overhead.

References:

1. Parallel and High Performance Computing, by Robert Robey and Yuliana Zamora, Manning
2. High Performance Computing 2e (RISC Architectures, Optimization & Benchmarks), by Kevin Dowd, O′Reilly Media
3. High Performance Computing: Modern Systems and Practices 2e, by Thomas Sterling, Maciej Brodowicz and Matthew Anderson, Morgan Kaufmann
4. High Performance Computing: Problem Solving with Parallel and Vector Architectures, by Gary W. Sabot, Addison Wesley
5. Introduction to high performance Computing for Scientists and Engineers, by George Hager and Gerhard Wellein, CRC Press

R.K.D.F. UNIVERSITY, BHOPAL
B.TECH (Computer Science and Engineering)
FOURTH YEAR, Semester – VII
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (CSE)	Blockchain Technologies	CS-8021(B)	3L-1T-0P	4

Course Outcomes:

After completing this course satisfactorily, a student will be able to:

CO1 Explain cryptographic building blocks and reason about their security.

CO2 Learn how the individual components of the Bitcoin protocol make the whole system works transactions, script, blocks, and the peer-to-peer network.

CO3 Define how Bitcoin mining works.

CO4 Exploit applications of Blockchain in real world sceneries.

Course Contents:

UNIT I

Introduction: Overview of Blockchain, Public Ledgers, Bitcoin, Smart Contracts, Block in a Block chain, Transactions, Distributed Consensus, Public vs Private Blockchain, Understanding Cryptocurrency to Blockchain, Permissioned Model of Blockchain, Overview of Security aspects of Blockchain; Basic Crypto Primitives: Cryptographic Hash Function, Properties of a hash function, Hash pointer and Merkle tree, Digital Signature, Public Key Cryptography, A basic cryptocurrency.

UNIT II

Understanding Blockchain with Cryptocurrency: Bitcoin and Blockchain: Creation of coins, Payments and double spending, Bitcoin Scripts, Bitcoin P2P Network, Transaction in Bitcoin Network, Block Mining, Block propagation and block relay. Working with Consensus in Bitcoin: Distributed consensus in open environments, Consensus in a Bitcoin network, Proof of Work (PoW) – basic introduction, Hash Cash PoW, Bit coin PoW, Attacks on PoW and the monopoly problem, Proof of Stake, Proof of Burn and Proof of Elapsed Time, The life of a Bitcoin Miner, Mining Difficulty, Mining Pool.

UNIT III

Understanding Blockchain for Enterprises: Permissioned Blockchain: Permissioned model and use cases, Design issues for Permissioned blockchains, Execute contracts, State machine replication, Overview of Consensus models for permissioned blockchain - Distributed consensus in closed environment, Paxos, RAFT Consensus, Byzantine general problem, Byzantine fault tolerant system, Lamport-Shostak-Pease BFT Algorithm, BFT over Asynchronous systems.

UNIT IV

Enterprise Application of Blockchain: Cross border payments, Know Your Customer (KYC), Food Security, Mortgage over Blockchain, Blockchain enabled Trade, We Trade – Trade Finance Network, Supply Chain Financing, and Identity on Blockchain.

UNIT V

Blockchain Application Development: Hyperledger Fabric - Architecture, Identities and Policies, Membership and Access Control, Channels, Transaction Validation, Writing smart contract using Hyperledger Fabric, Writing smart contract using Ethereum, Overview of Ripple and Corda.

References:

1. Blockchain Technology: From Theory to Practice, by Sudeep Tanwar, Springer
2. Blockchain Technology, by Kumar Saurabh and Ashutosh Saxena, Wiley
3. Blockchain in Action, by Bina Ramamurthy, Manning
4. Mastering Blockchain: Inner Workings of Blockchain, from Cryptography and Decentralized Identities, to DeFi, NFTs and Web3, by Imran Bashir, Packt Publishing Ltd.
5. Blockchain Technology: Algorithms and Applications, by S. Asharaf, Neelima Sivadas, S. Adarsh, John Franklin, Wiley
6. Blockchain Essentials You Always Wanted to Know, by Kancharla, Vibrant Publishers
7. Mastering Blockchain: Unlocking the Power of Cryptocurrencies, Smart Contracts, and Decentralized Applications, by Lorne Lantz and Daniel Cawrey, O'Reilly Media
8. Blockchain Essentials: Core Concepts and Implementations, by Ramchandra Sharad Mangrulkar and Pallavi Vijay Chavan, Apress
9. Grokking Bitcoin, by Kalle Rosenbaum and David A. Harding, Manning
10. Mastering Bitcoin: Programming the Open Blockchain, 2e, by Andreas M. Antonopoulos, O'Reilly Media
11. Blockchain: Blueprint for a New Economy, by Melanie Swan, O'Reilly Media
12. Blockchain Basics: A Non-Technical Introduction in 25 Steps, by Daniel Drescher, Apress

R.K.D.F. UNIVERSITY, BHOPAL
B.TECH (Computer Science and Engineering)
FOURTH YEAR, Semester – VII
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (CSE)	Object-Oriented Software Engineering	CS-8021(C)	3L-1T-0P	4

Course Outcomes:

After completing this course satisfactorily, a student will be able to:

CO1 Identify domain objects, their properties, and relationships among them

CO2 Identify and model/represent domain constraints on the objects and (or) on their relationships

CO3 Develop design solutions for problems on various object-oriented concepts

CO4 Model different perspectives of object-oriented software design (UML)

Course Contents:

UNIT I

Review of Object-Oriented Concepts and Principles: The Object-Oriented Paradigm, Basic Concepts, Software Development Life Cycle and Model Architectures.

UNIT II

Introduction to RUP: Basic Concepts, Symptoms in Software Development and their Root Causes, Best Practices of RUP, RUP software life cycle, 4+1 view model, Various Workflows.

UNIT III

Introduction to UML, Notations, Relationships, Stereotypes, Study of UML based tools Like Rational Rose, Poseidon, etc. Object Oriented Analysis: Conventional v/s OO analysis approach, Requirement analysis, Use case diagram, Activity diagram, Analysis class Model.

UNIT IV

Object Oriented Design: Conventional v/s OO design approach, Design of CRC cards, Class diagram Behavioral Modeling: Interaction Diagram, State chart Diagram, Implementation Diagram: Component and deployment Diagram. Illustrative Case Studies like ATM, Payroll, Course and Registration System.

UNIT V

Object Oriented Testing: Correctness and consistency of OOA & OOD models, Testing Strategies and test cases for OO software process, Project Management, Rational Tool Mentors. Introduction to Design Patterns.

References:

1. The Unified Modelling Language User Guide, by Grady Booch, James Rumbaugh, Ivar Jacobson, Pearson Education
2. Object-Oriented and Classical Software Engineering, by Stephen R. Schach, McGraw Hill
3. Object Oriented Software Engineering: A Use Case Driven Approach Paperback, by Ivar Jacobson, Magnus Christerson, Patrik Jonsson, and Gunnar Overgaard, Pearson Education
4. Classical and Object-Oriented Software Engineering with UML and C++, by Stephen Schach, McGraw Hill Education
5. Object-Oriented Software Engineering: Practical Software Development using UML and Java, by Timothy C. Lethbridge and Robert Laganmiere, McGraw Hill Education
6. Object-Oriented Software Engineering, by Yogesh Singh and Ruchika Malhotra, PHI Learning Pvt. Ltd.
7. Object-Oriented Software Engineering Using UML, Patterns, and Java™ - 2e, by Bernd Bruegge and Allen H. Dutoit, Pearson Education
8. Object-Oriented Software Engineering with UML: A Hands-On Approach, by Roger Y. Lee, Nova Science Publishers Inc.
9. Object-Oriented Software Engineering: An Agile Unified Methodology, by David C. Kung, McGraw Hill Education
10. Understanding Object-Oriented Software Engineering: A Practical Approach, by Stefan Sigfried, IEEE Press
11. Object-Oriented and Classical Software Engineering, by Stephen Schach, McGraw Hill Education
12. Object-oriented Software: Design and Maintenance, by Miriam A M Capretz and Luiz Fernando Capretz, World Scientific Publishing
13. Object Oriented Software Engineering, by Deven N. Shah and G.P. Bherde, Dreamtech Press
14. Design Patterns, Elements of Reusable Object-Oriented Software, by Gamma G. Helm, Johnson, Addison Wesley
15. Object Oriented Software Engineering: The Unfied Modelling User Guide, by Ivon Jacobson, G. Booch, Addison Wesley

R.K.D.F. UNIVERSITY, BHOPAL
B.TECH (Computer Science and Engineering)
FOURTH YEAR, Semester – VII
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (CSE)	Image Processing and Computer Vision	CS-8031(A)	3L-0T-0P	3

Course Outcomes:

After completing this course satisfactorily, a student will be able to:

CO1 Design and implement various algorithms for digital image processing and computer vision.

CO2 Understanding the fundamental concepts and the mathematical tools used in digital image processing and computer vision.

CO3 Identify basic concepts, terminology, theories, models and methods in the field of computer vision.

CO4 Describe basic methods of computer vision related to multi-scale representation, edge detection and detection of other primitives, stereo, motion and object recognition.

CO5 Assess which methods to use for solving a given problem, and analyse the accuracy of the methods.

Course Contents:

UNIT I

Introduction to computer vision and Image processing (CVIP): Basics of CVIP, History of CVIP, Evolution of CVIP, CV Models, Image Filtering, Image Representations, Image Statistics, Recognition Methodology: Conditioning, Labeling, Grouping, Extracting, and Matching, Morphological Image Processing: Introduction, Dilation, Erosion, Opening, Closing, Hit-or-Miss transformation, Morphological algorithm operations on binary images, Morphological algorithm operations on gray-scale images, Thinning, Thickening, Region growing, region shrinking.

UNIT II

Image Representation and Description: Representation schemes, Boundary descriptors, Region descriptors Binary Machine Vision: Thresholding, Segmentation, Connected component labeling, Hierarchal segmentation, Spatial clustering, Split& merge, Rule-based Segmentation, Motion-based segmentation. Area Extraction: Concepts, Data-structures, Edge, Line-Linking, Hough transform, Line fitting, Curve fitting (Least-square fitting).

UNIT III

Region Analysis: Region properties, External points, Spatial moments, Mixed spatial gray-level moments, Boundary analysis: Signature properties, Shape numbers. General Frame Works for

Matching: Distance relational approach, Ordered structural matching, View class matching, Models database organization.

UNIT IV

Facet Model Recognition: Labeling lines, understanding line drawings, Classification of shapes by labeling of edges, Recognition of shapes, consisting labeling problem, Back-tracking Algorithm, Perspective Projective geometry, Inverse perspective Projection, Photogrammetric - from 2D to 3D, Image matching: Intensity matching of ID signals, Matching of 2D image, Hierarchical image matching. Object Models and Matching: 2D representation, Global vs. Local features.

UNIT V

Knowledge Based Vision: Knowledge representation, Control-strategies, Information Integration. Object recognition-Hough transforms and other simple object recognition methods, Shape correspondence and shape matching, Principal component analysis, feature extraction, Neural network and Machine learning for image shape recognition.

References:

1. Digital Image Processing, 4e, by Rafael C. Gonzalez and Richard E. Woods, Pearson Education
2. Fundamentals of Digital Image Processing, by Anil K. Jain, Pearson Education
3. A Computational Introduction to Digital Image Processing, by Alasdair McAndrew, CRC Press
4. Digital Image Processing, 2e, by S. Jayaraman, S. Esakkirajan and T. Veerakumar, McGraw Hill Education
5. Digital Image Processing Using Python, by Manish Kashyap, BPL Publications
6. Digital Image Processing 2e, by S. Sridhar, Oxford University Press
7. Image Processing, Analysis, and Machine Vision, Milan Sonka, Vaclav Hlavac and Roger Boyle, Thomson Learning
8. Fundamentals of Digital Image Processing, by S. Annadurai and R. Shanmugalakshmi, Pearson Education
9. Digital Image Processing, by Kenneth R. Castleman, Pearson Education
10. Digital Image Processing and Analysis, by B. Chanda and D. Dutta Majumder, PHI Learning Pvt. Ltd.
11. Image Processing Masterclass with Python, by Sandipan Dey, BPB Publications
12. Digital Image Processing: An Algorithmic Introduction, by Wilhelm Burger and Mark J. Burge, Springer
13. Digital Image Processing, 6e, by Bernd Jahne, Springer
14. Computer Vision: A Modern Approach 2e, by David A. Forsyth and Jean Ponce, Pearson Education
15. Foundations of Computer Vision, by Antonio Torralba, Phillip Isola, and William T. Freeman, MIT Press

R.K.D.F. UNIVERSITY, BHOPAL
B.TECH (Computer Science and Engineering)
FOURTH YEAR, Semester – VII
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (CSE)	Game Theory with Engineering Applications	CS-8031(B)	3L-0T-0P	3

Course Outcomes:

After completing this course satisfactorily, a student will be able to:

CO1 Formulate and analyze strategic interactions using game-theoretic models.

CO2 Apply solution concepts like Nash Equilibrium.

CO3 Apply Subgame Perfect Equilibrium, and Bayesian Equilibrium in engineering.

CO4 Evaluate applications in auctions, negotiation, market competition, and engineering.

Course Contents:

UNIT I

Introduction: Game Theory, Strategic form (normal form) games, Dominant strategies, dominated strategies, Nash Equilibrium (pure strategies), Applications: Market entry, coordination games

UNIT II

Mixed Strategies: Dynamic Games of Perfect Information, Mixed Strategy Nash Equilibrium, Expected utility and randomization, Extensive form games, Subgame Perfect Equilibrium (SPE), Backward induction, Applications: Sequential games, trust games

UNIT III

Repeated and Evolutionary Games: Repeated games (finite and infinite horizon), Grim trigger and tit-for-tat strategies, Folk Theorem and strategic enforcement, Evolutionary game theory basics, Applications: Cooperation, collusion

UNIT IV

Bayesian Games: Static games with incomplete information, Bayesian Nash Equilibrium, Auctions: First-price, second-price, common vs private value, Signaling and Screening models, Applications: Job market signaling, insurance, political games

UNIT V

Cooperative Games and Mechanism Design: Cooperative games: Core, Shapley value, Bargaining models (Nash bargaining solution), Mechanism design: Incentive compatibility, Revelation Principle, Vickrey–Clarke–Groves (VCG) mechanisms, Social choice and voting mechanisms

References:

1. An Introduction to Game Theory, by Martin J. Osborne, Oxford University Press,
2. Mathematical Game Theory, by Ulrich Faigle, World Scientific Publishing
3. A Course in Game Theory, by Thomas S Ferguson, World Scientific Publishing
4. Mathematical Game Theory and Applications, by Mazalov, Wiley
5. Game Theory An Introduction, by Steven Tadelis, Princeton University Press
6. Introduction to Game Theory, by Stef Tijs, Eurospan
7. Game Theory: A Modeling Approach, by Richard Alan Gillman and David Housman, CRC Press
8. Game Theory: Understanding the Mathematics of Life, by Brian Clegg, Icon Books
9. Insights into Game Theory: An Alternative Mathematical Experience, by Ein-Ya Gura and Michael Maschler, Cambridge University Press
10. Game Theory: A Beginner's Guide to Game Theory Mathematics, Strategy & Decision-Making, by John Cummings, Ingram Publishing
11. An Introductory Course on Mathematical Game Theory and Applications, by Julio Gonzalez-Diaz and Ignacio Garcia-Jurado, American Mathematical Society
12. Algorithmic Game Theory, by Noam Nisan, Tim Roughgarden, Eva Tardos and Vijay V. Vazirani, Cambridge University Press

R.K.D.F. UNIVERSITY, BHOPAL
B.TECH (Computer Science and Engineering)
FOURTH YEAR, Semester – VII
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (CSE)	Mobile Application Development	CS-8031(C)	3L-0T-0P	3

Course Outcomes:

After completing this course satisfactorily, a student will be able to:

CO1 Apply essential Android Programming concepts

CO2 Develop various Android applications related to layouts and rich uses interactive interfaces

CO3 Develop Android applications related to mobile related server-less database

CO4 Work on real-life problems of mobile applications development.

Course Contents:

UNIT I

Introduction to Mobile Application Development: Definition of mobile computing, various types of mobile computing devices (mobile computers, smart phones and dedicated devices). Web based applications, Native applications and Compare and contrast web-based mobile applications against native applications, history of mobile platforms (PDA's, Notebooks, smartphones, Internet protocols for mobile applications .i.e. WAP), evolution of browsers and Internet languages such as HTML and JavaScript.

UNIT II

Infrastructure: Describe mobile and cell phone technologies (CDMA, GSM, 3G, 4G), Compare and contrast 3G and 4G, Internet terms: IP address, subnet mask, gateway, DNS, static vs Dynamic IP, transport including HTTP, routing, secure connections, proxies and reverse proxies. Need for storage, local Storage, storage on Web

UNIT III

HTML/CSS/DOM and Scripting: Basic HTML: validation, rendering and web browser, Cascading Style Sheets (CSS) and how to use them, document object model (DOM) : document, objects, model, DOM tree and DOM's utilization in web design, basic JavaScript code and constructs of the JavaScript language.

UNIT IV

Designing mobile user interfaces: Design mobile interfaces, usability, ways to test user interfaces, various types of user interfaces for mobile apps : Interactive voice response (IVR), SMS/MMS, Mobile

web, Native applications, Hybrids, mobile application development design considerations: Text entry, screen size, user interface and user context.

UNIT V

Mobile Platforms: URIs for mobile apps, Compare and contrast native mobile platforms such as tightly controlled (IPhone), open (Android), and licensed (Windows Mobile), web as a mobile application platform.

References:

1. Android Wireless Application Development, 3e, by Lauren Darcey and Shane Conder, Pearson Education
2. Professional Android 4 Application Development, by Reto Meier, Wiley
3. Beginning Android, by Mark L. Murphy, Apress
4. Pro Android 5, by, Satya Komatineni, Dave MacLean, and Grant Allen, Apress
5. Head First Android Development: A Brain-Friendly Guide, by Dawn Griffiths and David Griffiths, O''Reilly Media
6. Learning Android Develop Mobile Apps Using Java and Eclipse, by Marko Gargenta and Masumi Nakamura, O'Reilly Media
7. Programming Android, by Zigurd Mednieks, O'Reilly Media
8. Android Cookbook: Problems and Solutions for Android Developers 2e, by Ian F. Darwin, O'Reilly Media
9. Mobile Design and Development: Practical Concepts and Techniques for Creating Mobile Sites and Web Apps, by Brian Fling, O'Reilly Media