R.K.D.F. UNIVERSITY, BHOPAL
B.TECH (Information Technology)
SECOND YEAR-Semester – III
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (IT)	Engineering Mathematics-III	IT-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 (Information Technology)
SECOND YEAR, Semester – III
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (IT)	Data structure & Algorithms	IT-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 Oh 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 (Information Technology)
SECOND YEAR, Semester – III
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (IT)	Computer Organization & Architecture	IT-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 (Information Technology)
SECOND YEAR, Semester – III
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (IT)	Digital Circuit and System	IT-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 (Information Technology)
SECOND YEAR, Semester – III
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (IT)	Value Education	IT-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 (Information Technology)
SECOND YEAR, Semester – III
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (IT)	Software Lab 1 (C++)	IT-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 (Information Technology)
SECOND YEAR, Semester – IV
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (IT)	Environmental Engineering	IT-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 (Information Technology)
SECOND YEAR, Semester – IV
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (IT)	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 (Information Technology)
SECOND YEAR, Semester – IV
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (IT)	Software Engineering	IT-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 (Information Technology)
SECOND YEAR, Semester – IV
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (IT)	Design and Analysis of Algorithm	IT-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 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 (Information Technology)
SECOND YEAR, Semester – IV
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (IT)	Computer Network	IT-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, Flow 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 (Information Technology)
SECOND YEAR, Semester – IV
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (IT)	Software Lab II (Java)	IT-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 (Information Technology)
THIRD YEAR, Semester – V
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (IT)	Operating Systems	IT-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 (Information Technology)
THIRD YEAR, Semester – V
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (IT)	Object Oriented Programming	IT-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 (Information Technology)
THIRD YEAR, Semester – V
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (IT)	Discrete Structure	IT-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 (Information Technology)
THIRD YEAR, Semester – V
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (IT)	Microprocessor & Interfacing	IT-5031(B)	4L-0T-0P	4

Course Outcomes:

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

CO1 Understand the basic concepts of microcomputer systems.

CO2 Understand the architecture and software aspects of microprocessor 8086.

CO3 Write Assembly language program in 8086.

CO4 Interface peripherals for 8086.

CO5 Design elementary aspect of microprocessor based system.

Course Contents:

UNIT I

8086 Hardware Architecture

Intel 8086 - Pin Description – Operating Modes of 8086 – Pin description for Minimum Mode – Pin Description for Maximum Mode – Register Organization of 8086 – Bus Interface Unit – Execution Unit – Interrupts – 8086 Based Computer System

UNIT II

Programming The 8086

Addressing modes of 8086 – 8086 Instruction Groups – Addressing Mode Byte – Segment Register Selection – Segment Override – 8086 Instructions – Assembly Language Programming for 8086.

UNIT III

Memory And I/O Interfacing

Basic Interfacing concept – Memory Mapped I/O – I/O mapped I/O – Generation of Control Signals – 8086 Addressing and Address Decoding – ROM Address Decoding – RAM Address Decoding – Interfacing I/O Device, 74LS138 and PROM Decoder.

UNIT IV

Programmable Peripheral Devices

Interfacing 8255A Programming 8255A - Mode 0-Mode 1 – Mode 2 Operations - 8254- DMA Data Transfer – Interfacing 8257 DMA Controller – Interfacing 8259 – Serial Data Communication – Interfacing 8251.

UNIT V

Advanced Microprocessors

Power Microprocessor PC601 – Pentium PRO Microprocessor – The Pentium Pro Processor Pipeline – Pentium II – Celeron – Pentium III – Pentium 4 – Itanium Processor – Alpha Microprocessor

References:

1. Microprocessor and interfering programming and Hardware, by Doughles V. Hall, McGraw Hill Education
2. Microprocessors and Microcontrollers Architecture Programming and System Design 8085, 8086, 8051, 8096, by Krishna Kant, PHI learning Pvt. Ltd.
3. 8086 Microprocessor and Applications, 3e, by Nagoor Kani, CBS Publishers and Distributors Pvt. Ltd.
4. Advanced Microprocessor and Peripherals, 3e by K Bhurchandi and AK Ray, McGraw Hill Education
5. Microprocessor 8086: Architecture, Programming and Interfacing, by Sunil Mathur, PHI Learning Pvt. Ltd.
6. Microprocessors 8086 Series, 2e by Narendra Kumar, Prism Books Pvt. Ltd.
7. The 8086 Microprocessor Programming & Interfacing The PC, by Kenneth J. Ayala, Cengage Learning Pvt. Ltd.

R.K.D.F. UNIVERSITY, BHOPAL
B.TECH (Information Technology)
THIRD YEAR, Semester – V
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (IT)	Internet & Web Technology	IT-5031(C)	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 (Information Technology)
THIRD YEAR, Semester – V
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (IT)	Theory of Computation	IT-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 (Information Technology)
THIRD YEAR, Semester – V
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (IT)	E-Commerce and Governance	IT-5041(B)	4L-0T-0P	4

Course Outcomes:

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

CO1 Understand the basic concepts and technologies used in the field of e-commerce and e-governance.

CO2 Understand the processes of developing and implementing information Systems.

CO3 Be aware of the ethical, social, and security issues of e-payment and information systems.

CO4 Understand the impact of e-business on different fields and industries.

CO5 Understand the implications for the management of e-commerce and governance.

Course Contents:

UNIT I

Introduction to E-Business and E-Commerce: Definition the e-Commerce and e-Business, e-commerce Types of EC transactions, e-Business Models. Internet Marketing and e-Tailing, Elements of e-Business Models. benefits and limitations of e-Commerce.

UNIT II

E-Marketplaces: Structures, Mechanisms, Economics & impacts: Define e-Marketplace and their Functions. e-Marketplace types and their features. various types of auctions and list their characteristics. benefits, limitations and impacts of auctions. E-Commerce in the wireless environment. Competition in the DE and impact on industry.

UNIT III

E-Business Applications, E-Procurement and E-Payment Systems: Integration and e-Business suits, ERP, e-SCM, CRM, E-Payment. E-Procurement definition, processes, methods and benefits. Discuss the categories and users of smart cards. Describe payment methods in B2B EC.

UNIT IV

The Impact of E-Business on Different Fields and Industries: E-Tourism, Employment and Job Market Online Online Real Estate, Online Publishing and e-Books, Banking and Personal Finance Online, On-Demand Delivery Systems and E-Grocers, Online Delivery of Digital Products.

UNIT V

E-Learning and Online Education: Electronic learning, benefits and drawbacks of e-Learning. The e-Learning Industry. e-Content development and tools. Major technologies used in e-Learning. Different approaches for e-Learning delivery. Evaluation of e-Learning

Text Book:

1. Electronic Commerce: A Managerial Perspective, Turban, E. et al., Prentice Hall-2008.
2. Frontiers of e-commerce, Ravi Kalakota, Pearson.
3. Electronic Business and Electronic Commerce Management, 2nd edition, Dave Chaffey, Prentice Hall, 2006
4. e-Learning Tools and Technologies, Horton and Horton, Wiley Publishing.

References:

1. Electronic Commerce 2002: A Managerial Perspective, by Efraim Turban, David King, Jae K. Lee, Merrill Warkentin, and H. Michael Chung, Pearson Education
2. Frontiers of E-Commerce, Ravi Kalakota and Andrew B Whinston, Pearson Education
3. E-Business and E-Commerce, by Dave Chaffey, Prentice Hall
4. E-learning Tools and Technologies, by William Horton and Katherine Horton, John Wiley & Sons
5. Essentials of E-Commerce Technology, by V. Rajaraman, PHI Learning Pvt. Ltd.
6. E-Commerce: Fundamentals and Applications, by Henry Chan, Raymond Lee, Tharam Dillon, and Elizabeth Chang, Wiley
7. E-Governance: Concepts and Case Studies, by C.S.R. Prabhu, PHI Learning Pvt. Ltd.

R.K.D.F. UNIVERSITY, BHOPAL
B.TECH (Information Technology)
THIRD YEAR, Semester – V
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (IT)	Java Programming	IT-5041(C)	4L-0T-0P	4

Course Outcomes:

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

CO1 Understand the knowledge of the structure and model of the Java programming language.

CO2 Use the Java programming language for various programming tasks.

CO3 Develop software in the Java programming language.

CO4 Evaluate user requirements for software functionality required to decide whether the Java programming language can meet user requirements.

CO5 Propose the use of certain technologies by implementing them in the Java programming language

Course Contents:

UNIT I

The Java Environment: Java Development Kit (JDK) , Java virtual machine, Java programming environment (compiler, interpreter, applet viewer, debugger), Java Applications Programming Interface(API), Basic idea of application and applet. Java as an object oriented language: objects, classes, encapsulation, inheritance and software reuse, polymorphism, abstract classes and abstract methods,: defining an interface, implementing & applying interfaces, variables in interfaces, extending interfaces, Packages, scope and life-time; Access specifies; Constructors; Copy constructor; this pointer; finalize() method; arrays; Memory allocation and garbage collection

UNIT II

AWT: Containers and components, AWT classes, window fundamentals: Component, Container, Panel, Window, Frame, Canvas, AWT Controls, Layout Managers and Menus: adding and removing control, Labels, Button, Check Box, Radio Button, Choice, menu, Text area, Scroll list, Scrollbar; Frame; Layout managers flow layout, Grid layout, Border layout, Card layout. Java Event Handling Model: Java's event delegation model - Ignoring the event, Self-contained events, Delegating events; The event class hierarchy; The relationship between interface, methods called, parameters and event source; Adapter classes; Event classes action Event, Adjustment Event, Container Event, Focus Event, Item Event, Eye Event, Mouse Event, Text Event, Window Event. Applets: Applet security restrictions; the class hierarchy for applets; Life cycle of applet; HTML Tags for applet Introduction to Swing: swing library, Building applications using Swings.

UNIT III

Multithreading and Exception Handling: Overview of simple threads, Basic idea of multi-threaded programming, Thread synchronization: Locks, synchronized methods, synchronized block, Thread scheduling, Producer-consumer relationship, Daemon thread, Basic idea of exception handling, stack based execution and exception propagation, Exception types: Exception Handling: Try, Catch, Finally, Throw statement, Assertions

UNIT IV

Input/Output: Exploring Java I/O, Directories, stream classes The Byte stream: Input stream, output stream, file input stream, file output stream, print stream, Random access file, the character streams, Buffered reader, buffered writer, print writer, serialization. JDBC: JDBC-ODBC bridge; The connectivity model; The driver manager; Navigating the result set object contents; java.sql Package; The JDBC exception classes; Connecting to Remote database.

UNIT V

Java Networking: exploring java. Net package Networking Basics: Socket, Client server, reserved sockets, servers, Internet addressing, TCP sockets, UDP sockets. RMI: Client/Server architecture, RMI registry services; Steps of creating RMI Application and an example.

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
6. Java RMI: Designing & Building Distributed Applications, by William Grosso, O'Reilly Media

R.K.D.F. UNIVERSITY, BHOPAL
B.TECH (Information Technology)
THIRD YEAR, Semester – V
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (IT)	Lab (Linux)	IT-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 (Information Technology)
THIRD YEAR, Semester – V
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (IT)	Lab (Python)	IT-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 (Information Technology)
THIRD YEAR, Semester – VI
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (IT)	Wireless and Mobile Computing	IT-6011	4L-0T-2P	6

Course Outcomes:

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

CO1 Explain the basic concepts of wireless network and wireless generations.

CO2 Demonstrate the different wireless technologies such as CDMA, GSM, GPRS etc.

CO3 Explain the design considerations for deploying the wireless network infrastructure.

CO4 Differentiate and support the security measures, standards. Services and layer wise security considerations.

Course Contents:

UNIT I

Antenna, radiation 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

Mobile Device Operating Systems: Special Constraints & Requirements, Commercial Mobile Operating Systems. Software Development Kit: iOS, Android etc. M-Commerce: Structure, Pros & Cons, Mobile Payment System, Security Issues

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 Jochen 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 (Information Technology)
THIRD YEAR, Semester – VI
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (IT)	Compiler Design	IT-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 of Parser – Grammars, Error Handling, Context-free grammars – Writing a grammar, Top Down Parsing - General Strategies Recursive Descent Parser Predictive Parser - LL(1) Parser-Shift Reduce Parser – LR Parser- 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 (Information Technology)
THIRD YEAR, Semester – VI
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (IT)	Computer Graphics & Multimedia	CS-6031(A)	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 (Information Technology)
THIRD YEAR, Semester – VI
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (IT)	Artificial Intelligence	IT-6031(B)	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 (Information Technology)
THIRD YEAR, Semester – VI
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (IT)	Embedded System	IT -6031(C)	4L-0T-0P	4

Course Outcomes:

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

CO1 Explain the embedded system concepts and architecture of embedded systems.

CO2 Describe the architecture of 8051 microcontroller and write embedded program for it.

CO3 Select elements for an embedded systems tool

CO4 Understand the memory types used in embedded systems

CO5 Design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability

Course Contents:

UNIT I

Introduction to Embedded Systems: Definition of embedded system, embedded systems vs. general computing systems, history of embedded systems, classification, major application areas, purpose of embedded systems, characteristics and quality attributes of embedded systems, common design metrics, and processor technology: general purpose processor, application specific processor, single purpose processor.

UNIT II

Embedded System Architecture: Von Neumann v/s Harvard architecture, instruction set architecture, CISC and RISC instructions set architecture, basic embedded processor, microcontroller architecture, CISC & RISC examples: 8051, ARM, DSP processors.

UNIT III

Input Output and Peripheral Devices Timers and counters, watchdog timers, interrupt controllers, PWM, keyboard controller, analog to digital converters, real time clock. Introduction to communication protocols: basic terminologies, concepts, serial protocol: I2C, CAN, firewire, USB. Parallel protocols: PCI bus, IrDA, bluetooth, IEEE 802.11, wireless protocols.

UNIT IV

Memory System Architecture Caches, virtual memory, MMU, address translation, memory and interfacing, memory write ability and storage performance. Memory types, composing memory –

advance RAM interfacing, microprocessor interfacing I/O addressing, interrupts, direct memory access, arbitration multilevel bus architecture.

UNIT V

Embedded System Supporting Technologies, Difference between normal OS and RTOS, scheduling algorithms. Case study: Tiny OS, VxWorks, QNX. Overview of VLSI technology, introduction to device drivers, Case studies: washing machine, air-conditioning, auto focus camera

References:

1. Embedded Systems Introduction, 4e, by Raj Kamal, McGraw Hill Education
2. Making Embedded Systems: Design Patterns for Great Software, 2e, by Elecia White, O'Reilly Media
3. Embedded Systems: A Contemporary Design Tool, 2e, by James K. Peckol, Wiley
4. Introduction to Embedded Systems, 2e, by K.V. Shibu, McGraw Hill Education
5. Introduction to Embedded Systems, 2e, by Ashford Lee Edward, PHI Learning Pvt. Ltd.
6. An Embedded Software Primer, by David E Simons, Pearson Education
7. Embedded System Design: A Unified Hardware/Software Introduction, by Frank Vahid and Tony Givargis, Wiley

R.K.D.F. UNIVERSITY, BHOPAL
B.TECH (Information Technology)
THIRD YEAR, Semester – VI
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (IT)	Wireless Sensor Network	IT-6041(A)	4L-0T-0P	4

Course Outcomes:

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

CO1 Understand WSN architecture and components.

CO2 Learn various communication protocols and standards.

CO3 Study data aggregation, routing, localization, and synchronization techniques.

CO4 Analyze performance and energy-efficiency issues.

CO5 Explore real-world applications and challenges in WSN deployment.

Course Contents:

UNIT I

Introduction to Wireless Sensor Network:
Definition and Overview, Applications: Environmental Monitoring, Health, Military, Smart Cities, Components: Sensors, Actuators, Nodes, Architecture, WSN Architecture and Platforms, Hardware and Sensor Node Architecture Motes (TelosB, MicaZ, etc.), Operating Systems for WSN (TinyOS, Contiki)

UNIT II

Wireless Communication in WSN:
Radio Propagation, Modulation and Signal Processing, MAC Protocols (TDMA, CSMA, S-MAC, T-MAC), Routing in WSN, Flat, Hierarchical, and Location-Based Routing, Directed Diffusion, Routing Algorithms - LEACH, PEGASIS, GEAR.

UNIT III

Data Aggregation and Compression:
Data-centric Routing, In-network Processing, Compression Techniques, Localization and Synchronization, Localization Techniques (GPS-free), Time Synchronization Protocols - Reference Broadcast Synchronization (RBS), Timing-sync Protocol for Sensor Network (TPSN)

UNIT IV

Energy Efficiency and Power Management:
Sources of Power Consumption, Sleep Scheduling and Energy Harvesting, Duty Cycling, Security in WSN, Threat Models, Secure Routing, Cryptography in Resource-Constrained Devices

UNIT V

Simulation and Tools:

OMNeT++, Cooja, TOSSIM, Practical Case Studies and Simulations, Module 10: Advanced Topics and Applications, Internet of Things (IoT) and WSN Integration, WSN in Industrial Automation, Smart Agriculture and Smart Homes

References:

1. Protocols and Architectures for Wireless Sensor Networks, by Holger Karl and Andreas Willig, Wiley
2. Wireless Sensor Networks: An Information Processing Approach, by Feng Zhao and Leonidas Guibas, Morgan Kaufmann (Elsevier)
3. Wireless Sensor Networks - Signal Processing and Communications Perspectives, by Lang Tong Ananthram Swami, Qing Zhao, and Yao-Win Hong, Wiley
4. Building Wireless Sensor Networks: with ZigBee, XBee, Arduino, and Processing, by Robert Faludi, O'Reilly Media
5. Fundamentals of Wireless Sensor Networks: Theory and Practice, by Waltenegus Dargie and Christian Poellabauer, Wiley
6. Wireless Sensor Networks: Architecture, Applications, Advancements, by S. R. Vijayalakshmi and S. Muruganand, Mercury Learning and Information
7. A Complete Guide to Wireless Sensor Networks: from Inception to Current Trends, by Ankur Dumka, Arindam Biswas, Hardwari Lal Mandoria, and Sandip K. Chaurasiya, CRC Press

R.K.D.F. UNIVERSITY, BHOPAL
B.TECH (Information Technology)
THIRD YEAR, Semester – VI
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (IT)	Internet Of Things	IT-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 & 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 (Information Technology)
FOURTH YEAR, Semester – VII
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (IT)	Cloud Computing	IT-6041(C)	4L-0T-0P	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 (Information Technology)
THIRD YEAR, Semester – VI
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (IT)	Data Analytics Lab	IT-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 (Information Technology)
THIRD YEAR, Semester – VI
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (IT)	Skill Development Lab	IT-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 (Information Technology)
FOURTH YEAR, Semester – VII
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (IT)	Soft Computing	IT-7011	2L-1T-1P	4

Course Outcomes:

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

CO1 Understand concept of ANN and explain the XOR problem.

CO2 Use supervised neural networks to classify given inputs.

CO3 Understand unsupervised neural networks for clustering data.

CO4 Build Fuzzy inference system using concepts of fuzzy logic.

Course Contents:

UNIT I

Introduction to Neural Network: Concept, biological neural network, comparison of ANN with biological NN, evolution of artificial neural network, Basic models, Types of learning, Linear separability, XOR problem, McCulloch-Pitts neuron model, Hebb rule

UNIT II

Supervised Learning: Perceptron learning, Single layer/multilayer, Adaline, Madaline, Back propagation network, RBFN, Application of Neural network in forecasting, data compression and image compression.

UNIT III

Unsupervised learning: Introduction, Fixed weight competitive nets, Kohonen SOM, Counter Propagation networks, (Theory, Architecture, Flow Chart, Training Algorithm and applications), Introduction to Convolutional neural networks (CNN) and Recurrent neural networks (RNN)

UNIT IV

Fuzzy Set: Introduction, Basic Definition and Terminology, Properties and Set-theoretic Operations, Fuzzy Relations , Membership Functions and their assignment, Fuzzy rules and fuzzy Reasoning, Fuzzy if-then Rules, Fuzzy Inference Systems. Application of Fuzzy logic in solving engineering problems.

UNIT V

Genetic Algorithm: Introduction to GA, Simple Genetic Algorithm, terminology and operators of GA (individual, gene, fitness, population, data structure, encoding, selection, crossover, mutation, convergence criteria). Reasons for working of GA and Schema theorem, GA optimization problems

like TSP (Travelling salesman problem), Network design routing. Introduction to Ant Colony optimization (ACO) and Particle swarm optimization (PSO)

References:

1. Principles of Soft Computing, 3e, by SN Sivanandam and SN Deepa, Wiley
2. Introduction to Soft Computing: Neuro - Fuzzy and Genetic Algorithms, by Samir Roy, Pearson Education
3. Neuro-Fuzzy and Soft Computing: A Computational Approach to Learning and Machine Intelligence, by JSR Jang, CT Sun, and E Mizutani, Pearson Education
4. Soft Computing with MATLAB Programming, by N.P. Padhy and S.P. Simon, Oxford University Press
5. Soft Computing, by Saroj Kaushik and Sunita Tewari, McGraw Hill Education
6. Neural Network , Fuzzy logic and Genetic Algorithm, by S. Rajshekaran and G.A.V. Pai, PHI Learning Pvt. Ltd.
7. Introduction to Artificial Neural Network System, by Jack M. Zurad, Jaico Publishing House

List of Experiments:

1. Form a perceptron net for basic logic gates with binary input and output.
2. Using Adaline net, generate XOR function with bipolar inputs and targets.
3. Calculation of new weights for a Back propagation network, given the values of input pattern, output pattern, target output, learning rate and activation function.
4. Design fuzzy inference system for a given problem.
5. Maximize the function $y = 3x + 2$ for some given values of x using Genetic algorithm.
6. Implement Travelling salesman problem using Genetic Algorithm.
7. Optimisation of problem like Job shop scheduling using Genetic algorithm

R.K.D.F. UNIVERSITY, BHOPAL
B.TECH (Information Technology)
FOURTH YEAR, Semester – VII
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (IT)	Simulation and Modelling	IT -7021(A)	3L-1T-0P	4

Course Outcomes:

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

CO1 Define, describe and apply basic concepts related to modeling, identification and simulation.

CO2 Classify various simulation models and give practical examples for each category.

CO3 Demonstrate the ability to apply knowledge of probability and statistics for simulation and modelling.

CO4 Construct a model for a given set of data and motivate its validity.

Course Contents:

UNIT I

Modeling and Simulation Concepts: System Concepts, What is a Model? Type of Models, Modeling and Simulation, Continuous vs Discrete System Simulation, Numerical Integration vs Continuous Simulation, Analog vs Digital Simulation, Simulation vs Monte-Carlo Simulation, Nature of Computer Modeling and Simulation, When to Use Simulation? Limitations of Simulation

UNIT II

Probability Concepts in Simulation Stochastic variables, Random numbers: Pseudo-random generators, Testing of Pseudo-random number generators, Generation of non-uniformly distributed random numbers, discrete and continuous random variables, and density and distributive functions, Study of few distributions such as Poisson, Normal, Uniform.

UNIT III

Simulation of Continuous Systems Introduction, Differential equations, Pure Pursuit Problem, Simulation of Chemical Reaction, Autopilot Simulation and Simulation of other Continuous systems

UNIT IV

Simulation of Discrete Systems Arrival patterns and service times, Simulation of Queuing System - Elementary idea about networks of Queuing with particular emphasis to computer system environment

UNIT V

Verification & Validation Design of simulation experiments and validation of simulation experiments

comparing model data units and real system data, Simulation Language A brief introduction to important discrete and continuous languages such as GPSS (Study & use of the language). Use of data base & AI techniques in the area of modeling and simulation.

References:

1. System Simulation with Digital Computers, by Narsing Deo, PHI Learning Pvt. Ltd.
2. System Simulation, 2e, by Geoffrey Gordon, PHI Learning Pvt. Ltd.
3. Introduction to Simulation, by James A. Payne, McGraw Hill Education
4. Probability & Statistics with Reliability Queuing and Computer Science Applications, 2e, by Kishor S. Trivedi, Wiley
5. Computer Simulation Application, by J. Reitman, Wiley
6. Theory Of Modeling and Simulation: Integrating Discrete Even and Continuous Complex Dynamic Systems, 2e, by Bernard P. Zeigler, Herbert Prarhofer, and Tag Gon Kim, Elsevier
7. Hands-On Simulation Modeling with Python, by Giuseppe Ciaburro, Packt Publishing Ltd.
8. Modeling and Simulation: An Application-Oriented Introduction, by Hans-Joachim Bungartz, Stefan Zimmer, Martin Buchholz, Dirk Pflüger, Sabine Le Borne, and Richard Le Borne, Springer
9. Modeling and Simulation, by Hartmut Bossel, AK Peters
10. Modeling and Simulation in Python, by Allen B. Downey, No Starch Press

R.K.D.F. UNIVERSITY, BHOPAL
B.TECH (Information Technology)
FOURTH YEAR, Semester – VII
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (IT)	Deep and Reinforcement Learning	IT-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 (Information Technology)
FOURTH YEAR, Semester – VII
Course Content

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

Course Outcomes:

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

CO1 Ability to identify the characteristics of datasets and compare the trivial data and big data for various applications.

CO2 Ability to select and implement machine learning techniques and computing environment that are suitable for the applications under consideration.

CO3 Ability to understand and apply scaling up machine learning techniques and associated computing techniques and technologies.

CO4 Ability to recognize and implement various ways of selecting suitable model parameters for different machine learning techniques.

Course Contents:

UNIT I

Conceptualization and summarization: Representation of data. Modeling of machine learning techniques. Application of big data computing technologies.

UNIT II

Trivial data versus Big data: Representation learning. Publicly available datasets. Scalability and Scaling up techniques. Report writing using Latex.

UNIT III

Big data computing environment: Modern data analytics technologies like Hadoop and MapReduce. Suitable programming languages like Python, Java and C, Big data friendly machine learning scikit-learn, NumPy, Pandas, Matplotlib libraries. Software platforms like MATLAB or R

UNIT IV

Machine learning techniques: Three phases of machine learning. types of learning, support vector machine, decision trees and random forests, deep learning

UNIT V

Scaling up machine learning: Dimensionality reduction techniques like principal component analysis and feature hashing, Online processing technique called stochastic gradient descent, Big data machine learning models.

References:

1. Data Science From Scratch: First Principles with Python, 2e, by Joel Grus, O'Reilly Media
2. Introduction to Statistical Learning: with Applications in Python, by Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani, and Jonathan Taylor, Springer
3. Python Data Science Handbook: Essential Tools for Working with Data, 2e, by Jake VanderPlas, O'Reilly Media
4. Data Science and Machine Learning using Python, by Dr Reema Thareja, McGraw Hill Education
5. Introduction to Data Science: Practical Approach with R and Python, by B. Uma Maheswari and R. Sujatha, Wiley
6. Big Data: Principles and Best Practices of Scalable Real-Time Data Systems, by Nathan Marz and James Warren, Manning
7. Introducing Data Science: Big Data, Machine Learning, and More, Using Python Tools by Davy Cielen, Arno D.B. Meysman and Mohamed Ali, Manning
8. Big Data Analytics, by Raj Kamal, Preeti Saxena, McGraw Hill Education
9. Big Data Analytics 2e, by RadhaShankarmani, M. Vijaylakshmi, Wiley
10. Big Data with Hadoop MapReduce: A Classroom Approach, by Anand Paul, Ganeshkumar Pugalendhi and Rathinaraja Jeyaraj, CRC Press
11. Big Data and Analytics: The key concepts and practical applications of big data analytics, by Jugnesh Kumar, Anubhav Kumar and Rinku Kumar, BPB Publications
12. Big Data Analytics: Concepts, Techniques, Tools and Technologies, by G. Sudha, M. Thangaraj and S. Suguna, PHI Learning Pvt. Ltd.
13. Big Data and Analytics, 2e, by Seema Acharya and Subhashini Chellappan, Wiley
14. Big Data Big Analytics, by Michael Minelli, Michele Chambers and AmbigaDhiraj, Wiley

R.K.D.F. UNIVERSITY, BHOPAL
B.TECH (Information Technology)
FOURTH YEAR, Semester – VII
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (IT)	Cyber Laws and Forensics	IT-7031(A)	4L-0T-0P	4

Course Outcomes:

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

CO1 Become aware of various cyber-crimes and cyber laws.

CO2 Underline the need of digital forensic and role of digital evidences.

CO3 Understand different types of digital evidences that can be presented to support investigations.

CO4 List the methods to generate legal evidence and supporting investigation reports.

CO5 Use various digital forensic tools.

Course Contents:

UNIT I

Introduction to cybercrime, definition, cyber-crime and information security, classification of cybercrimes, cybercrime: the legal perspectives, an Indian perspective, cybercrime and the Indian ITA 2000, a global perspective on cybercrime, Cyber offences: How criminals plan them, Tools and methods used in cyber-crime, Need of cyber law, The Indian IT act, challenges to Indian law and cybercrime scenario in India, digital signature and Indian IT act, Amendments in the Indian IT act, cybercrime and punishment

UNIT II

Law and framework for information security, law for intellectual property rights (IPR), patent law, copy right law, Indian copyright act, privacy issue and law in Hong Kong, Japan, and Australia, data protection act in Europe, health insurance portability and accountability act of 1996 (HIPAA), Gramm-leach-Bliley act of 999 (GLAB), Sarbanes-Oxley (SOX), legal issue in data mining, building security into software/system development life cycle

UNIT III

Digital forensics Science, The need for computer forensics, Understanding computer forensics, computer forensics versus other related disciplines, A brief History of computer Forensics, Cyber forensics and digital evidence, Digital forensics lifecycle, chain of custody concept, Network forensics, Approaching a computer forensics investigation, setting up a computer forensics laboratory, Forensics and social networking sites, computer forensics from compliance perspective, challenges in computer forensics, forensics auditing, antiforensics

UNIT IV

Current Computer Forensics Tools, Evaluating Computer Forensics Tool Needs, Types of Computer Forensics Tools, Tasks Performed by Computer Forensics Tools, Tool Comparisons, Other Considerations for Tools, Computer Forensics Software Tools, Command-Line Forensics Tools, UNIX/Linux Forensics Tools, Other GUI Forensics Tools, Computer Forensics Hardware Tools, Forensic Workstations

UNIT V

Forensics of hand held devices, Investigating Network Intrusions and Cyber Crime, Network Forensics and Investigating logs, Investigating network Traffic, Investigating Web attacks ,Router Forensics. Cyber forensics tools and case studies.

References:

1. The Indian Cyber Law, by Suresh T. Vishwanathan, Bharat Law House
2. Information Technology Laws and Cyber Crimes, by Nirav Vithalani, Shashwat Publication
3. Cyber Security and Cyber Laws, by Nilakshi Jain and Ramesh Menon, Wiley
4. Fundamental of Cyber Security (Principles, Theory & Practices), by Mayank Bhushan, Rajkumar Singh Rathore, and Aatif Jamshed, BPB Publications
5. Digital Forensics with Open Source Tools, by Cory Altheide and Harlan Carvey, Syngress Media
6. Guide to Computer Forensics and Investigations, by Bill Nelson, Amelia Phillips, and Christopher Steuart, Cengage Learning Pvt. Ltd.
7. Digital Forensics: Digital Evidence in Criminal Investigation, by Angus M. Marshall, Wiley-Blackwell
8. The Cambridge Handbook of Digital Evidence in Criminal Investigations, by Vanessa Franssen and Stanislaw Tosza, Cambridge University Press

R.K.D.F. UNIVERSITY, BHOPAL
B.TECH (Information Technology)
FOURTH YEAR, Semester – VII
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (IT)	Digital Image Processing	IT-7031(B)	4L-0T-0P	4

Course Outcomes:

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

CO1 Explain basic concepts of image processing.

CO2 Have knowledge of techniques employed for the enhancement of images.

CO3 Interpret image segmentation and representation techniques.

CO4 Explain the concepts of morphology in image processing.

Course Contents:

UNIT I

Introduction and Digital Image Fundamentals: The origins of Digital Image Processing, Examples of Fields that Use Digital Image Processing, Fundamentals Steps in Image Processing, Elements of Digital Image Processing Systems, Image Sampling and Quantization, Some basic relationships like Neighbours, Connectivity, Distance Measures between pixels, Linear and Non Linear Operations

UNIT II

Image Enhancement in the Spatial Domain: Some basic Gray Level Transformations, Histogram Processing, Enhancement Using Arithmetic and Logic operations, Basics of Spatial Filters, Smoothening and Sharpening Spatial Filters, Combining Spatial Enhancement Methods

UNIT III

Image Enhancement in the Frequency Domain: Introduction to Fourier Transform and the frequency Domain, Smoothing and Sharpening Frequency Domain Filters, Homomorphic Filtering. Image Restoration A model of The Image Degradation / Restoration Process, Noise Models, Restoration in the presence of Noise Only Spatial Filtering, Periodic Noise Reduction by Frequency Domain Filtering, Linear Position-Invariant Degradations, Estimation of Degradation Function, Inverse filtering, Wiener filtering, Constrained Least Square Filtering, Geometric Mean Filter, Geometric Transformations

UNIT IV

Image Compression: Coding, Interpixel and Psychovisual Redundancy, Image Compression models, Elements of Information Theory, Error free comparison, Lossy compression, Image compression standards. Image Segmentation Detection of Discontinuities, Edge linking and boundary detection, Threshold, Region Oriented Segmentation, Motion based segmentation

UNIT V

Representation and Description: Representation, Boundary Descriptors, Regional Descriptors, Use of Principal Components for Description, Introduction to Morphology, Some basic Morphological Algorithms. Object Recognition Patterns and Pattern Classes, Decision-Theoretic Methods, Structural Methods.

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

R.K.D.F. UNIVERSITY, BHOPAL
B.TECH (Information Technology)
FOURTH YEAR, Semester – VII
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (IT)	Component Based Technology	IT -7031(C)	4L-0T-0P	4

Course Outcomes:

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

CO1 Familiarization with Component Based Systems, their Purpose and Scope.

CO2 Analyse Software Engineering Practices related to CBD.

CO3 Apply design of Software Component Infrastructures.

CO4 Design real-life component-based software engineering

Course Contents:

UNIT I

Component Definition: Definition of Software Component and its Elements. Component Models and Component Services: Concepts and Principles, COTS Myths and Other Lessons Learned in Component-Based Software Development, Roles for Component-Based Development, Common High Risk Mistakes in Component-Based Software Engineering, CBSE Success Factors: Integrating Architecture, Process, and Organization, Software Engineering Practices: The Practice of Software Engineering, From Subroutines to Subsystems: Component-Based Software Development

UNIT II

The Design of Software Component Infrastructures: Software Components and the UML, Component Infrastructures: Placing Software Components in Context, Business Components, Components and Connectors: Catalysis Techniques for Defining Component Infrastructures, An Open Process for Component-Based Development, Designing Models of Modularity and Integration

UNIT III

The Management of Component-Based Software Systems: Measurement and Metrics for Software Components, The Practical Reuse of Software Components, Selecting the Right COTS Software: Why Requirements are Important, Software Component Project Management Processes, The Trouble with Testing Software Components, configuration Management and Component Libraries, The Evolution, Maintenance and Management of Component-Based Systems

UNIT IV

Component Technologies: Overview of the CORBA Component Model, Transactional COM+: Designing Scalable Applications, The Enterprise JavaBeans Component Model, Choosing Between COM+, EJB, and CCM, Software Agents as Next Generation Software Components

UNIT V

Legal and Regulatory: Component-based Software Engineering (CBSE) as a Unique Engineering Discipline, The Future of Software Components: Standards and Certification, Commercial Law Applicable to Component-Based Software, The Effects of UCITA on Software Component Development and Marketing, Future of CBSE

References:

1. Component-Based Development: Principles and Planning for Business Systems, by Katharine Whitehead, Addison Wilsey
2. Essential COM, by Don Box, Addison Wilsey
3. Component-Based Systems: Estimating Efforts Using Soft Computing Techniques, by Kirti Seth, Ashish Seth, and Aprna Tripathi, CRC Press

R.K.D.F. UNIVERSITY, BHOPAL
B.TECH (Information Technology)
FOURTH YEAR, Semester – VII
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (IT)	Data Science Lab	IT -7041	0L-0T-2P	2

Course Outcomes:

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

CO1 Understand the R programming language.

CO2 Exposure on solving of data science problems.

CO3 Understand the classification and regression model.

Course Contents:

LIST OF EXPERIMENTS:

Week-1	**R as Calculator Application**
a.	Using with and without R objects on console
b.	Using mathematical functions on console
c.	Write an R script, to create R objects for calculator application and save in a specified location in disk
Week-2	**Descriptive Statistics in R**
a.	Write an R script to find basic descriptive statistics using summary
b.	Write an R script to find subset of dataset by using subset ()
Week-3	**Reading and Writing Different Types of Datasets**
a.	Reading different types of data sets (.txt, .csv) from web and disk and writing in file in specific disk location
b.	Reading Excel data sheet in R
c.	Reading XML dataset in R
Week-4	**Visualizations**
a.	Find the data distributions using box and scatter plot
b.	Find the outliers using plot
c.	Plot the histogram, bar chart and pie chart on sample data
Week-5	**Correlation and Covariance**
a.	Find the correlation matrix
b.	Plot the correlation plot on dataset and visualize giving an overview of relationships among

	data on iris data
Week-6	**Regression Model**
a.	Import a data from web storage. Name the dataset and now do Logistic Regression to find out relation between variables that are affecting the admission of a student in a institute based on his or her GRE score, GPA obtained and rank of the student. Also check the model is fit or not. require (foreign), require (MASS).
Week-7	**Multiple Regression Model**
a.	Apply multiple regressions, if data have a continuous independent variable. Apply on above Dataset
Week-8	**Regression Model for Prediction**
a.	Apply regression Model techniques to predict the data on above dataset
Week-9	**CLASSIFICATION MODEL**
a.	Install relevant package for classification
b.	Choose classifier for classification problem
c.	Evaluate the performance of classifier
Week-10	**Clustering Model**
a.	Clustering algorithms for unsupervised classification
b.	Plot the cluster data using R visualizations

References:

1. R Cookbook: Proven Recipes for Data Analysis, Statistics, and Graphics 2e, by JD Long and Paul Teetor, O'Reilly Media
2. Statistical Programming in R, by K.G. Srinivasa, G.M. Siddesh, Chetan Shetty, and B.J. Sowmya, Oxford University Press
3. The Book of R: A First Course in Programming and Statistics, by Tilman M. Davies, No Starch Press
4. Hands on Programming With R: Write Your Own Functions and Simulations, by Garrett Grolemund, O'Reilly Media
5. Hands on Data Science with R: From basics to advanced, by Dr. Meenakshi, Mrs. S.R. Nandini, Dr. C. Mahiba, and Dr. B.R. Nanditha, Clever Fox Publishing
6. Beginning R: The Statistical Programming Language, by Mark Gardener, Wrox
7. R for Data Science: Import, Tidy, Transform, Visualize, and Model Data, by Hadley Wickham and Garrett Grolemund, O'Reilly Media

R.K.D.F. UNIVERSITY, BHOPAL
B.TECH (Information Technology)
FOURTH YEAR, Semester – VII
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (IT)	Case Tools Lab	IT -7051	0L-0T-2P	2

Course Outcomes:

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

CO1 Understand the UML.

CO2 Exposure on solving of real-life transaction problem using UML.

CO3 Understand object-oriented design using UML.

Course Contents:

LIST OF EXPERIMENTS:

Week-1	**Introduction to UML**
	Study of UML
Week-2	**Online Purchase System**
	Create a UML model for Online Purchase System
Week-3	**Library Management System**
	Create a UML model for Library Management System
Week-4	**E-Ticketing**
	Create a UML model for E-Ticketing
Week-5	**Quiz System**
	Create a UML model for Quiz System
Week-6	**Mark Analyzing System**
	Create a UML model for Student Mark Analyzing System
Week-7	**E-Mail Client System**
	Create a UML model for E-Mail Client System
Week-8	**Telephone Dialing System**
	Create a UML model for Telephone Dialing System
Week-9	**Point of Sale**
	Create a UML model for Point of Sale
Week-10	**Working Company**

	Create a UML model for Working Company
Week-11	**ATM Transactions**
	Create a system to design Bank ATM Transactions and generate code by using MS Access as back end and VB as front end
Week-12	**Student Mark Analysis**
	Create a system to design Student Mark Analysis System and generate code by using MS Access as back end and VB as front end.

References:

1. The Unified Modeling Language User Guide, 2e, Grady Booch, James Rumbaugh, Ivar Jacobson, Pearson Education
2. Appliying UML and Patterns: An Introduction to Object Oriented Analysis and Design and Iterative Development, 3e, Craig Larman, Pearson Education
3. Object Oriented Modeling and Design with UML, 2e, by Michael R. Blaha and James R Rumbaugh, Pearson Education
4. Learning UML 2.0: A Pragmatic Introduction to UML, by Russ Miles and Kim Hamilton, O'Reilly Media
5. UML Diagramming: A Case Study Approach, by Suriya Sundaramoorthy, CRC Press
6. Fundamentals of Object-Oriented Design in UML, Meilir Page-Jones, Pearson Education
7. Modeling with UML: Language, Concepts, Methods, by Bernhard Rumpe, Springer

R.K.D.F. UNIVERSITY, BHOPAL
B.TECH (Information Technology)
FOURTH YEAR, Semester – VII
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (IT)	Information Security	IT-8011	3L-1T-2P	6

Course Outcomes:

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

CO1 Understand key terms and concepts in information security and Cryptography and evaluate the cyber security needs of an organization.

CO2 Acquire knowledge to secure computer systems, protect personal data, and secure computer networks in an organization.

CO3 Design operational and strategic information security strategies and policies.

Course Contents:

UNIT I

Introduction: Fundamental Principles of Information Security - Confidentiality, Availability, Integrity, Non Repudiation, the OSI Security Architecture, Security Attacks, Security Services, Security Mechanisms, a Model for Network Security; Classical Encryption Techniques: Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Steganography

UNIT II

Block Ciphers and Data Encryption Algorithm: Block Cipher Principles, The Data Encryption Standard, The Strength of DES, Differential and linear cryptanalysis, Block Cipher Design Principles; Advanced Encryption Standard: Evaluation criteria of AES, The AES Cipher, Multiple Encryption and Triple DES, Block Cipher modes of operation, Stream Ciphers, Confidentiality using Symmetric Encryption.

UNIT III

Public Key Encryption: Principles of Public Key Cryptosystems, The RSA algorithm, Key Management, Diffie-Hellman Key Exchange, Elliptic curve cryptography; Message Authentication and Hash Functions: Authentication requirements, Authentication Functions, Message Authentication Codes, Hash Functions, Security of Hash Functions and MACs; Hash and MAC algorithms: Secure Hash Algorithm, HMAC; Digital Signatures and Authentication Protocols, Digital Signature Standard

UNIT IV

Authentication Applications, Kerberos, X.509 Authentication Service, Public key infrastructure; Electronic Mail Security: Pretty Good Privacy; IP Security: IP Security Overview, Architecture,

Authentication header, encapsulating security payload, Key management; Web Security: Web security considerations, Secure Socket Layer and Transport layer Security, Secure Electronic Transaction.

UNIT V

System Security: Intruders, Intrusion Detection, Password management; Malicious Software: Different type of malicious software, Viruses and related threats, Virus Countermeasures, Threats and attacks on Information Security, DoS and DDos Attacks; Security controls required for Information Security, Firewalls: Firewall design principles, Trusted Systems, Common criteria for information technology security evaluation.

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 (Information Technology)
FOURTH YEAR, Semester – VII
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (IT)	Engineering Economics and Management	IT-8021(A)	3L-1T-0P	4

Course Outcomes:

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

CO1 Impart knowledge, with respect to concepts, principles and practical applications of Economics, which govern the functioning of a firm/organization under different market conditions.

CO2 To help the students to understand the fundamental concepts and principles of management; the basic roles, skills, functions of management, various organizational structures and basic knowledge of marketing.

CO3 Foster interdisciplinary thinking by integrating engineering economic analysis with management strategies to solve complex, real-world engineering problems.

CO4 Encourage consideration of ethical, social, and environmental factors in engineering and economic decision-making.

Course Contents:

UNIT I

Introduction to Economics; Definitions, Nature, Scope, Difference between Microeconomics and Macroeconomics Theory of Demand and Supply; meaning, determinants, law of demand, law of supply, equilibrium between demand & supply Elasticity; elasticity of demand, price elasticity, income elasticity, cross elasticity

UNIT II

Theory of production; production function, meaning, factors of production (meaning and characteristics of Land, Labour, capital and entrepreneur), Law of variable proportions & law of returns to scale Cost; meaning, short run and long run cost, fixed cost, variable cost, total cost, average cost, marginal cost, opportunity cost. Break even analysis; meaning, explanation, numerical

UNIT III

Markets; meaning, types of markets and their characteristics (Perfect Competition, Monopoly, Monopolistic Completion, Oligopoly) National Income; meaning, stock and flow concept, NI at current price, NI at constant price, GNP, GDP, NNP, NDP, Personal income, disposal income

UNIT IV

Basic economic problems; Poverty - meaning, absolute and relative poverty, causes, measures to reduce Unemployment: meaning, types, causes, remedies Inflation; meaning, types, causes, measures to control

UNIT V

Introduction to Management; Definitions, Nature, scope Management and administration, skill, types and roles of managers Management Principles; Scientific principles, Administrative principles, Maslow's Hierarchy of needs theory

.

Reference Books:

1.

2. Fundamentals of Management: Essential Concepts and Applications, Pearson Education, Robbins S.P. and Decenzo David A.

3. Economics: Principles of Economics, N Gregory Mankiw, Cengage Learning

4.

5.

6. Modern Economic Theory, By Dr. K. K. Dewett & M. H. Navalur, S. Chand Publications

References:

1. Engineering Economics, 2e, by R. Paneerselvam, PHI Learning Pvt. Ltd.
2. Fundamentals of Management: Essential Concepts and Applications, by Stephen P. Robbins, David A. De Cenzo, and Mary A. Coulter, Pearson Education
3. Principles of Economics, 6e, by N. Gregory Mankiw, South-Western Pub.
4. Principles and Practices of Management by L.M. Prasad, Sultan Chand and Sons
5. Principles of Management, 6e, by P.C. Tripathy and P.N. Reddy, McGraw Hill Education
6. The Economic Theory of Modern Society, by Michio Morishima, Cambridge University Press
7. Modern Economic Theory, by K.K. Dewett and M.H. Navalur, S. Chand

R.K.D.F. UNIVERSITY, BHOPAL
B.TECH (Information Technology)
FOURTH YEAR, Semester – VII
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (IT)	Machine Learning	IT-8021(B)	3L-1T-0P	4

Course Outcomes:

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

CO1 Recognize the characteristics of machine learning strategies.

CO2 Apply various supervised learning methods to appropriate problems.

CO3 Identify and integrate more than one technique to enhance the performance of learning.

CO4 Create probabilistic and unsupervised learning models for handling unknown pattern.

Course Contents:

UNIT I

Introduction: Introduction, Examples of various Learning Paradigms, Perspectives and Issues, Concept Learning, Version Spaces, Finite and Infinite Hypothesis Spaces, PAC Learning, VC Dimension

UNIT II

Supervised Learning Algorithms: Learning a Class from Examples, Linear, Non-linear, Multi-class and Multi-label classification, Decision Trees: ID3, Classification and Regression Trees (CART), Regression: Linear Regression, Multiple Linear Regression, Logistic Regression, Neural Networks: Introduction, Perceptron, Multilayer Perceptron, Support vector machines: Linear and Non-Linear, Kernel Functions, K-Nearest Neighbors

UNIT III

Ensemble Learning: Ensemble Learning Model Combination Schemes, Voting, Error-Correcting Output Codes, Bagging: Random Forest Trees, Boosting: Adaboost, Stacking

UNIT IV

Unsupervised Learning: Introduction to clustering, Hierarchical: AGNES, DIANA, Partitional: K-means clustering, K-Mode Clustering, Self-Organizing Map, Expectation Maximization, Gaussian Mixture Models, Principal Component Analysis (PCA), Locally Linear Embedding (LLE), Factor Analysis

UNIT V

Probabilistic Learning: Bayesian Learning, Bayes Optimal Classifier, Naïve Bayes Classifier, Bayesian Belief Networks, Mining Frequent Patterns

References:

1. Introduction to Machine Learning, by Alpaydin Ethem, PHI Learning Pvt. Ltd.
2. Foundations of Machine Learning, by Mehryar Mohri, Afshin Rostamizadeh, Ameet Talwalkar, and Francis Bach, MIT Press
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
8. Machine Learning, by Tom M. Mitchell, McGraw Hill Education
9. Hands-On Machine Learning with Scikit-Learn and Tensorflow: Concepts, Tools, and Techniques to Build Intelligent Systems, by Aurelien Geon, O'Reilly Media

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B.TECH (Information Technology)
FOURTH YEAR, Semester – VII
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (IT)	Robotics	IT-8021(C)	3L-1T-0P	4

Course Outcomes:

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

CO1 Understand robot mechanism.

CO2 Perform kinematic and dynamic analyses with simulation.

CO3 Design control laws for a robot.

CO4 Understand robot mechanism Integrate mechanical and electrical hardware for a real prototype of robotic device.

Course Contents:

UNIT I

Introduction to Robotics: Types and components of a robot, Classification of robots, closed-loop and open-loop control systems; Kinematics systems: Definition of mechanisms and manipulators, Social issues and safety

UNIT II

Robot Kinematics and Dynamics: Kinematic Modelling: Translation and Rotation Representation, Coordinate transformation, DH (Denavit-Hartenberg) parameters, Jacobian, Singularity, and Statics; Dynamic Modelling: Equations of motion: Euler-Lagrange formulation

UNIT III

Sensors and Vision System: Sensor: Contact and Proximity, Position, Velocity, Force, Tactile etc. Introduction to Cameras, Camera calibration, Geometry of Image formation, Euclidean/ Similarity/ Affine/ Projective transformations, Vision applications in robotics.

UNIT IV

Robot Control: Basics of control: Transfer functions, Control laws: P, PD, PID, Non-linear and advanced controls Robot Actuation Systems: Actuators: Electric, Hydraulic and Pneumatic; Transmission: Gears, Timing Belts and Bearings, Parameters for selection of actuators.

UNIT V

Control Hardware and Interfacing: Embedded systems: Architecture and integration with sensors, actuators, components, Programming for Robot Applications

References:

1. Introduction to Robotics, 3e, by S.K. Saha, McGraw Hill Higher Education
2. Robotics: Fundamental Concepts and Analysis, by Ashitava Ghosal, Oxford University Press
3. Introduction to Robotics: Analysis, Systems, Applications, by Saeed B. Niku, Pearson Education
4. Robotics and Control, by R.K. Mittal and I.J. Nagrath, McGraw Hill Education
5. Introduction to Robotics: Mechanics and Control, by John Craig, Pearson Education
6. Robot Modelling and Control, by Mark W. Spong, Seth Hutchinson, and M. Vidyasagar, John Wiley and Sons Inc,
7. Intelligent Mechatronic System: Modeling, Control and Diagnosis, by R. Merzouki, A.K. Samantaray, P.M. Phathak, and B. Ould Bouamama, Springer
8. Embedded System Design, 2e, by Steve Heath, Newnes
9. Elements of Robotics, by Mordechai Ben-Ari and Francesco Mondada, Springer

R.K.D.F. UNIVERSITY, BHOPAL
B.TECH (Information Technology)
FOURTH YEAR, Semester – VII
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (IT)	Parallel Computing	IT-8031(A)	4L-0T-0P	4

Course Outcomes:

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

CO1 To develop an understanding of various basic concepts associated with parallel computing environments.

CO2 Understand, appreciate and apply parallel and distributed algorithms in problem solving.

CO3 Acquire skills to measure the performance of parallel and distributed programs.

CO4 Design parallel programs to enhance machine performance in parallel hardware.

CO5 Design and implement parallel programs in modern environments such as CUDA, OpenMP, etc.

Course Contents:

UNIT I

Introduction: The need for parallelism, Forms of parallelism (SISD, SIMD, MISD, MIMD), Moore's Law and Multi-cores, Fundamentals of Parallel Computers, Communication architecture, Message passing architecture, Data parallel architecture, Dataflow architecture, Systolic architecture, Performance Issues.

UNIT II

Large Cache Design: Shared vs. Private Caches, Centralized vs. Distributed Shared Caches, Snooping-based cache coherence protocol, directory-based cache coherence protocol, Uniform Cache Access, Non-Uniform Cache Access, D-NUCA, S-NUCA, Inclusion, Exclusion, Difference between transaction and transactional memory, STM, HTM

UNIT III

Graphics Processing Unit: GPUs as Parallel Computers, Architecture of a modern GPU, Evolution of Graphics Pipelines, GPGPUs, Scalable GPUs, Architectural characteristics of Future Systems, Implication of Technology and Architecture for users, Vector addition, Applications of GPU

UNIT IV

Introduction to Parallel Programming: Strategies, Mechanism, Performance theory, Parallel Programming Patterns: Nesting pattern, Parallel Control Pattern, Parallel Data Management, Map:

Scaled Vector, Mandelbrot, Collative: Reduce, Fusing Map and Reduce, Scan, Fusing Map and Scan, Data Recognition: Gather, Scatter, Pack , Stencil and Recurrence, Fork-Join, Pipeline

UNIT V

Parallel Programming Languages: Distributed Memory Programming with MPI: trapezoidal rule in MPI, I/O handling, MPI derived data type, Collective Communication, Shared Memory Programming with Pthreads: Conditional Variables, read-write locks, Cache handling, Shared memory programming with Open MP: Parallel for directives, scheduling loops, Thread Safety, CUDA: Parallel programming in CUDA C, Thread management, Constant memory and Event, Graphics Interoperability, Atomics, Streams

References:

1. Parallel Computer Architecture: A Hardware/Software Approach, by David Culler, Jaswinder Pal Singh, and Anoop Gupta, Morgan Kaufmann
2. Multi-Core Cache Hierarchies, by Rajeev Balasubramonian, Norman P. Jouppi, and Naveen Muralimanohar, Springer
3. An Introduction to Parallel Programming, by Matthew Malensek and Peter Pacheco, Morgan Kaufmann
4. Programming Massively Parallel Processors: A Hands-on Approach, by Wen-mei W. Hwu, David B. Kirk, and Izzat El Hajj, Morgan Kaufmann
5. Hands-On GPU Programming with Python and Cuda, by Brian Tuomanen and Brian Tuomanen, Packt Pub.
6. Parallel Computing: From Multicores and GPU's to Petascale, by Barbara Chapman, F. Desprez, Gerhard R. Joubert, Alain Lichnewsky, Frans Peters, and Thierry Priol, IOS Press
7. Structured Parallel Programming: Patterns for Efficient Computation, by Michael McCool, James Reinders, and Arch Robison, Morgan Kaufmann
8. CUDA by Example: An Introduction to General-Purpose GPU Programming, by Jason Sanders and Edward Kandrot, Addison-Wesley
9. Introduction to Parallel Computing, 2e, by Ananth Grama, Anshul Gupta, George Karypis, and Vipin Kumar, Pearson Education
10. Introduction to Parallel Computing, by Niranjan N. Chiplunkar and Raju K., Wiley
11. Introduction to Parallel Computing: From Algorithms to Programming on State-of-the-Art Platforms, by Roman Trobec, Boštjan Slivnik, Patricio Bulić, and Borut Robič, Springer
12. Parallel Computing: Theory and Practice, by Michael Quinn, McGraw Hill Education

R.K.D.F. UNIVERSITY, BHOPAL
B.TECH (Information Technology)
FOURTH YEAR, Semester – VII
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (IT)	Game Theory with Engineering Applications	IT-8031(B)	4L-0T-0P	4

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 (Information Technology)
FOURTH YEAR, Semester – VII
Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.TECH (IT)	Blockchain Technology	IT-8031(C)	4L-0T-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