Navrachana University

Bachelor of Technology

(Information Technology)

Detailed Curriculum

2019-2023

Semester - 1

Course Code	Course Title	L	T	P	Credits
MA153	Linear Algebra and Matrices	2	0	0	2
EL101	Introduction to Electronics	3	0	2	4
IT120	Networking Basics	2	0	0	2
IT123	Workshop for IT	1	0	2	2
IT124	Computer Programming – I	3	0	0	3
IT127	Web Designing	2	0	0	2
EE106	Experiential Engineering-I	0	0	2	1
CT101	Critical Thinking and Reading	0	0	2	1
IT126	Applications of CP-I	0	0	4	2
IT128	Applications of WD	0	0	4	2
	Semester Credits				**21**

Semester - 2

Course Code	Course Title	L	T	P	Credits
IT131	Digital Logic Design	3	0	0	3
IT132	Computer Networks-I	3	0	0	3
IT133	Computer Programming – II	2	0	0	2
IT134	Data Structures	3	0	0	3
MA140	Discrete Mathematics	2	0	0	2
IT136	Experiential Engineering-II	0	0	2	1
IT137	Critical Thinking and Reading-II	0	0	2	1
IT138	Applications of CP-II	0	0	4	2
IT139	Applications of DS	0	0	2	1
	Interdisciplinary course	2	0	0	2
	Semester Credits				**20**

4 weeks summer Social Internship of 2 credits after semester - II

Semester - 3

Course Code	Course Title	L	T	P	Credits
ES201	Environmental Science	3	0	0	3
IT221	Analysis & Design of Algorithms	3	0	0	3
CS242	Computer Networks – II	3	0	2	4
IT222	Relational Database Management System	3	0	0	3
IT223	Open Source Technologies	2	0	0	2
IT224	Applications of RDBMS	0	0	4	2
IT225	Applications of OST	0	0	4	2
-	Interdisciplinary course	2	0	0	2
PS236	Social Internship	0	0	4	2
	Semester Credits				**21**

Semester –4

Course Code	Course Title	L	T	P	Credits
IT226	System Administration and Maintenance	2	0	2	3
IT227	Probability & Statistics	3	0	0	3
IT228	Software Engineering	3	0	0	3
IT229	Operating System Concepts	3	0	0	3
IT230	Object Oriented Programming	3	0	0	3
IT231	.NET Technology – I	2	0	0	2
IT232	Applications of OOP	0	0	4	2
IT233	Applications of .NET – I	0	0	4	2
	Semester Credits				**21**

SCOPE certification: An audit course of 2 credits after semester - IV

Semester - 5

Course Title	L	T	P	Credits
Enterpreneurship	2	0	0	2
System Modelling	2	0	0	2
Advanced Java Programming	2	0	0	2
Kernel Programming	2	0	0	2
Cloud Computing	2	0	2	2
Elective Stream Course – I	3	0	0	3
Elective Stream Course – II	2	0	0	2
Elective Stream Course – III	0	0	4	2
Applications of AJP	0	0	4	2
Applications of KP	0	0	4	2
SWAYAM course-1	2	0	0	2
Semester Credits				**23**

Semester –6

Course Title	L	T	P	Credits
Theory of Computation	3	0	0	3
Artificial Intelligence	3	0	0	3
Elective Stream Course – IV	3	0	0	3
Elective Stream Course –V	2	0	0	2
Elective Stream Course –VI	0	0	4	2
Mobile Application Development	1	0	4	3
Advanced .NET Concepts	1	0	4	3
Khoj(Optional)	0	0	6	3
SWAYAM course - 2	2	0	0	2
Semester Credits				**24**

4 weeks summer Internship of 2 credits after semester - VI

Semester - 7

Course Title	L	T	P	Credits
Moral Values & Ethics	2	0	0	2
Operations Research	3	0	0	3
Compiler Design	3	0	0	3
Distributed Computing	3	0	0	3
Elective Stream Course –VII	3	0	0	3
Elective Stream Course –VIII	2	0	0	2
Elective Stream Course –IX	0	0	4	2
In-House Project	0	0	6	3
SWAYAM course - 3	2	0	0	2
Semester Credits				**23**

Semester –8

Course Title	L	T	P	Credits
Full Semester Industrial Internship				12
Independent study				2
Semester Credits				**14**

Minor Electives

1. Internet of Things
2. Machine Learning
3. Data Science
4. Designing
5. Network and Information Security
6. Business Analysis and Quality Assurance

Credit Summary

Semester	**Credits**
Sem-I	21
Sem-II	20
ScoialInternship	2
Sem-III	21
Sem-IV	21
SCOPE certification	2
Sem-V	23
Sem-VI	24
Summer Internship	2
Sem-VI	23
Sem-VIII	14
Total Credits	**173**

Semester – I

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Course Code: MA153

Course Name: Linear Algebra and Matrices LTPC: 2-0-0-2

Unit -1: Systems of Linear Equations and Matrices

Systems of Linear Equations, Definition, Types of Matrices, Addition, Subtraction, Scalar Multiplication and Multiplication of Matrices, Adjoint and Inverseof a matrix. Solving systems of linear equations Applications of Systems of Linear Equations.

Unit 2: Eigen Values and Eigen Vectors

Determinants: Basic properties, Minors, Cofactors, Matrix Representation of Linear Transformations, Similarity, Eigen values and Eigenvectors, Eigen values and Eigen vectors, Diagonalization

Unit 3: Linear Combinations and Linear Independence:

Vectors in n R, Linear Combinations, Linear Independence Vector Spaces, Definition of a Vector Space, Subspaces, Basis and Dimension, Coordinates and Change of Basis

Unit 4: Linear Transformations:

Linear Transformations, The Null Space and Range, Isomorphism.

Unit 5: Inner Product Spaces:

The Dot Product on n R and Inner Product Spaces, Orthonormal Bases

Text Books:

1. Advanced Engineering Mathematics by Ervin Kreyszig, 10th Edition, 2015, Wiley.
2. Linear Algebra and Vector Calculus by Dr. K.R. Kachot, 7th Edition, 2015, Mahajan Publishing house

Reference Books:

1. Elementary Linear Algebra, Ron Larson, David C. Falvo, Houghton Mifflin, Harwurt Publishing Company, 2009.

Navrachana University

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Course Code: EL101

Course Name: Introduction to Electronics LTPC: 3-0-2-4

Unit – 1: Semiconductor Diodes

Introduction to semiconductor physics, junction breakdown, ideal diode, theory of PN junction diode, diode resistance, DC load line, transition and diffusion, switching, zener and avalanche breakdown, Introduction to tunnel diode, PIN diode, varactor diode and schottky diode

Unit – 2: Transistors

Introduction, Bipolar Junction Transistors: Transistor biasing, working and characteristics (input and output), current components, derivations, relationships, CB, CC and CE configurations; Field Effect Transistors: Classifications, construction, JFET: characteristics, working, MOSFET: DMOSFET and EMOSFET

Unit – 3: Applications of Electronic devices

DC power supplies: Half wave, full wave, rectifiers: Working and Derivations; Wave shaping circuits: Clippers and clampers; Transistor as an amplifier; Introduction to oscillators, multivibrators and feedback amplifiers

Text Books:

3. Robert T. Paynter, “Introductory electronic devices and circuits, 2006, PHI
4. David Bell “Electronic Devices and Circuits” 2007, PHI

Reference Books:

2. Theodore F. Bogart, “Electronic Devices & Circuits” Pearson Education, VI Edition, 2003
3. Rashid, “Microelectronic circuits” Thomson Publication, 1999
4. B.P. Singh & Rekha Singh, “Electronic Devices and Integrated Circuits” Pearson Education, 2006

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Course Code: IT120
Course Name: Networking Basics LTPC: 2-0-0-2

Unit 1: Data Communications and Networking

Data Communication introduction, Components of communication, Characteristics of communication, Communication Protocol and role of protocols for communication, Data representation forms, communication types: Simplex, half duplex, Full duplex; Communication Impairments: Noise, Delay, Jitter; Network Definition, criteria, Network Attributes: Type of connection: Point to point and multipoint; transmission concepts: unicasting, multicasting, broadcasting; Network Topologies. Network Categorization by scale: PAN, LAN, WAN, MAN; Circuit Switched Networks and Packet switched networks overview. Applications of computer networking

Unit 2: The Internet

History of internet, Example of Early Networks: ARPANET, NSFNET; Internetwork, Definition of internet, The client-server model, Introduction to WWW, Architecture of the Internet, Current position of internet, Internet standardization and management: Stadardization organizations and management bodies, De Facto and De Jure; Metrics for transmission of information. Information security in the internet: Attacks on a network: Active and Passive, Precautions for internet security.

Unit 3: Networking Devices and Wireless Networks

Networking devices: Repeaters, Bridges, Hubs, Switches, Gateways.

Wireless Technologies: 3G mobile phone networks, WLAN, WiFi, WiMax, Bluetooth, RFID and Sensor Networks.

Text Books:

1. Data Communications and Networking, 5th Edition, by Behrouz A. Forouzan, Mc Graw Hill Education.
2. Computer Networks, 5th Edition, Andrew S. Tanenbaum, David J. Wetherhall, Pearson Publication

Reference Books:

1. Introduction to Computer Networks and Cybersecurity by Chwan-Hwa (John) Wu, J. David Irwin. CRC Press
2. Introduction to Networking: How the Internet Works by Dr. Charles R Severance
3. Computer Networking a Top Down Approach, 5th Edition, James F. Kurose, Keith W. Ross, Pearson

Navrachana University

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Course Code: IT123

Course Name: Workshop for IT LTPC: 1-0-2-2

Unit-1: Comprehending the Computer System

Introduction to computer system, formal definition, Von Neumann Architecture, Harvard Architecture, Components of a computer System, Concepts of hardware and software, Types of software; Evolution of computer system, Future scope in computer science field

Unit-2: Computer system Internals

CPU: Computer Tower and its components, ROM: construction, types; RAM: construction, types; Secondary memory: construction, working; Optical Disks: Types, construction and working; Auxilliary memory: flash memories construction, standards; printer: construction, working, types, Monitor: construction, basic terminologies, Mouse: construction and working, Keyboard: construction and working, Introduction to Operating System: Command Line based and GUI based operating system, File Systems: FAT, NTFS

Unit-3: Computer System Implementation

Connecting different hardware of computer system, installing operating system: windows and linux ubuntu,using icons, saving files, creating directories, identifying paths, introducing cmd for windows and terminal for Ubuntu, basic commands for cmd: cmd, cd, chkdsk, chkntfs, cls, control, copy, date, del, dir, diskcopy, ipconfig, lock, logoff, map, nbstat, net, netstat, path, ping, power, print, ren, rename, unlock, shutdown; basic commands for linux: sudo, pwd, ls, cd, mkdir, rmdir, rm, touch, cp, mv, locate, cat, du, zip, unzip, uname, apt-get, chmod, hostname, ping, clear, using TAB; Using basic shortcut keys for windows; Application Programs for windows: Word processing software advanced features: Mail merge, Outline view, writing equations, convert tables to graphs, translate, inspect and protect document, hidden text; Powerpoint software advanced features: slide master view, use templates, re-arrange slides, smart art, set hyperlink, animated PPT; Spreadsheet software advanced features: Lookup, pie charts, combination charts, Data validation, error functions, removing duplicates, conditional formatting, If and OR, Macro, set hyperlink, transpose, indirect, format, concatenate, trim, round, choose, named ranges, input restriction, hide data

Text Books

1. Reema Thareja, Fundamentals of Computers 1st Edition, 2014, Oxford University Press
2. E. Balagurusamy, Fundamentals of Computers 1st Edition, 2009, Mc Graw Hill Higher Ed

Reference Books

1. V. Rajaraman, Introduction to information technology, 2nd Edition, PHI Learning Pvt. Ltd.
2. Steve Schwartz, Microsoft Office 2013: Visual Quickstart Guide 5th Edition, Pearson

Navrachana University

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Course Code: IT124
Course Name: Computer Programming – I LTPC: 3-0-0-3

Unit 1: Problem Solving and Introduction to C

Introduction to problem, different problem-solving techniques: flowchart, algorithm, pseudo code, Introduction to Programming, C language concepts and implementation: identifiers, keywords, variables, data types, operators, Operator precedence and associativity; Control Statements: Conditional execution and selection, applying if and switch statements, nesting if and else, restrictions on switch values, use of break and default with switch, Program Loops and Iteration, uses of while, do and for loops, multiple loop variables, using break and continue, Nested Loops, go to statement.

Unit 2: Array and Pointers

Arrays: Introduction to contiguous data types, Array notation and representation, manipulating array elements, one dimensional arrays, using multidimensional arrays, arrays of unknown or varying size, Array as strings, operations on strings. Pointers: Types and use of pointers, Array and Pointers, Pointers and Strings, Pointer and address arithmetic,

Unit 3: Modular Programming

Functions: Concept of modular programming, using functions, passing arguments by value, scope rules and global variables, Recursive functions. Storage Classes: automatic, register, static and external, using pointers as function arguments: call by value and call by reference.

Unit 4: Structure and Union

Structures: Purpose and usage of structures, declaring structures, assigning of structures, union, declaration and implementation of unions, difference between structure and union.

Unit 5: Dynamic Memory Allocation and File Manipulation

DMA: concept, significance, Functions for DMA: malloc (), calloc (), realloc (), free (); Concept of file, creation of file, Functions for file manipulation: fopen (), fclose (), fread (), fwrite ().

Text Books:

1. Programming in ANSI C, 8th Edition, Balagurusamy, Publisher McGraw Hill Education.

Reference Books:

1. Brian W. Kernighan, Dennis M. Ritchie, The C Programming Language: Ansi C, Version 2 Edition, PHI Learning (2012)
2. Problem Solving and Program Design in C, by Jeri R. Hanly, Elliot B. Koffman, Pearson Addison-Wesley, 2006.

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Course Code: IT127
Course Name: Web Designing LTPC: 2-0-0-2

Unit-1: The HTML standard

Introduction to the HTML standard, Definition of a tag/ elements, Layout of HTML document: DTD, HTML Tag, head tag andbodytag, comments; Elementary tags: Heading tags, paragraph Tag; Formatting Tags: PRE Tag, bold, italic, strong, emphasis, small, superscript, subscripttag, Special Characters; Attributes for HTML elements: style, color; Working with Images: meta Tag; Lists: Unordered Lists, Ordered Lists; Tables: TABLE, TR and TD Tags, Cell Spacing and Cell Padding, Colspan and Row span; Frames: Frameset, frames; hyperlinks: Anchor tag, attributes _blank, _self, _parent, _top, file paths; IFRAME, Forms: FORM and INPUT Tag, Text Box, Radio Button, Checkbox, SELECT Tag and Drop Down Lists, Hidden, Submit and Reset; The HTML 5 standard: HTML 5 semantic elements; HTML media: audio, video, media.

Unit 2:CSS

Introduction to CSS, Linking CSS in your HTML document: internal, external and inline css; selector definition and types: class selector, idselector and element selector; The CSS box model, Display and arrangementof elements using CSS; Margin and padding property; Font property, Styling tables using css, Navigation bars, dropdowns, image gallery, styling images, rounded corners, adding tool tips, styling forms using css, flex box, Responsive CSS: Gridview, images, media queries, viewport; CSS 3 standard.

Unit 3: Javascript and JQuery

The Document Object Model, JavaScript Variables and Data Types: Declaring Variables, Data Types; Statements and Operators; Control Structures: Conditional Statements, Loop Statements, array, functions; Object-Based Programming: Objects, properties, methods; Browser Object Model: Pop Up Alerts: Alert Boxes, Confirm Boxes, Prompt Boxes; JavaScript with HTML: Events, Event Handlers, form validation using javascript. Introduction to jquery, difference between javascript and Jquery, JqueryEvents, Selectors, Effects, Traversing, Properties, using Jquery with html/css, responsive websites, JQuery effects: hide, show, fade, slide. Responsive website design: color combinations, styling, fonts, effects in different media.

Text Books:

1. Developing Web Applications,2nd Edition, Ralph Moseley, M.T. Savaliya, Wiley Publications.
2. Web Technologies Balck Book, Edition 1, Kogent Learning Solutions Inc, Dreamtech Press

Reference Books:

1. Ivan Bayross, Web Enabled Commercial Application Development Using HTML, DHTML, JavaScript, Perl CGI, 3rd Edition, and BPB Publication
2. The Complete Reference: HTML &CSS, JQuery 5thedition, Thomas Powell, Mc Graw Hill Education

Semester – II

Navrachana University

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Course Code: MA140
Course Name: Discrete Mathematics LTPC: 2-0-0-2

Unit-1: Set, Functions and Relations

Introduction to set: Basic operations, subset and power set; Subset and Power set; Functions: Definition, on-one and onto functions, inverse and composition of functions, ceiling and floor functions, graph of functions; Relations and ordering: Properties of binary relations, graph and matrix representation of binary relation, equivalence relation, composition of binary relations, partial ordering, partially ordered sets;

Unit-2: Mathematical Logic

Mathematical Logic, Propositions, Logical Connectives, Truth tables, Propositional form, Logical equivalence, tautology and contradiction, Logical implication and equivalence, Algebra of propositions, predicate and quantifiers, interaction of logical operators and quantifiers. Predicate calculus, Rules of inference

Unit-3: Graph Theory

Definition, Elementary properties of graphs, Isomorphism of graphs, Subgraphs, Walks, Path and circuits, Connected graphs, Euler graphs, Operations on graphs, Hamiltonian circuits. Definition and properties of a tree, Rooted and binary trees, Spanning trees and fundamental circuits, Cut sets and its properties, Connectivity and separability, Planer graphs and Kuratowskis two graphs, Representation of planar graphs

Text Book:

1. Discrete mathematics and its applications (4^{th} edition) by K.H. Rosen (Mc Graw Hill International Edition)

Reference Books:

1. Graph Theory with applications to engineering and computer science by NarsinghDeo (Prentice Hall of India, New Delhi)
2. Elements of Discrete Mathematics by C.L. Liu (McCgraw Hill Book Co.)
3. Discrete Mathematics (4th Edition) by Richard Johnsonbaugh, (Prentice Hall of India International Edition, 1997)

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Course Code: IT131
Course Name: Digital Logic Design LTPC: 3-0-0-3

Unit-1: Number Systems & Boolean Algebra

Number Systems: Decimal, Binary, Octal, Hexadecimal; Number System Conversion; Binary Arithmetic, Integer representations: 1's complement & 2's complement, Floating point representations: IEEE floating point, representing floating point numbers, Binary Codes: Weighted, Non-Weighted Codes, Self complementing, Sequential: Excess-3 Code, Gray Code, Binary Coded Decimal (BCD) code; Error Detection and Correction code: Parity bit, Hamming Code., Alphanumeric: ASCII, EBCIDIC, Unicode

Unit-2: Boolean Algebra and Logic Gates

Logic operations: AND, OR, NOT, NAND, NOR, X-OR and X-NOR operations, Truth table formation, Boolean Algebra: Axioms and Laws, De morgan's theorem, Reducing Boolean Expressions, Boolean Expressions: SOP & POS forms, Minimization of switching functions using K-map: 2 variables, 3 variables, 4 variables, Don't care conditions, limitations of K-map, Basic gates: AND, OR, NOT; Universal gates: NOR, NAND, Other gates: XOR, XNOR, XOR and XNOR as inverter.

Unit-3: Combinational Circuits and Sequential Circuits

Introduction, design procedure, Combinational Circuits: Adder: Half, Full, Parallel binary adder: Ripple carry adder, BCD adder; Sutractors: Half, Full, 2's complement addition and subtraction using parallel adders, serial adders, difference between serial and parallel adders, Binary multipliers; Multiplexer, Demultiplexer, Encoder, Decoder; Sequential Circuits:Latches &Flip flops: SR, D, JK, T, Triggering in Flip flops, Race around condition, excitation tables in flip flops; Register: Shift, Counters: Asyncronous Ripple counter, Up/Down counter, Mod-N counter, Programable counter, Ring counter, propagation delay in counters.

Text Books:

1. Fundamentals of Digital Circuits, 4th edition, A Anand Kumar, PHI learning pvt ltd
2. Digital Logic and Computer Design, 1stEdition, June 2016, Morris Mano, Pearson Education India

Reference Books:

1. Modern digital electronics, 2010, Jain, R. P. McGraw-Hill Higher Education
2. Digital principles and applications, 2015, Leach, D. P, Malvino, A. P &Saha, G. McGraw Hill Education
3. Digital Computer Electronics, 2011, Malvino, A. P, Tata Mcgraw Hill Education Pvt Ltd

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Course Code: IT132

Course Name: Computer Networks - I LTPC: 3-0-0-3

Unit 1: Computer Networks and Network Models

Description of computer networks, Inception and present position, ISPs and internet backbone, Layered Architecture: services (Connection Oriented, Connectionless), protocols and their role in layered architecture, Relationship between services and protocols. The OSI reference model, The TCP/IP model.

Unit 2: Physical Layer

Theoretical basis: Basic Fourier transform; Data and Signals; Analog signals: types, Bandwidth; Digital Signals: Bit Rate, Bit Length, Baud, Baud rate; Digital Transmission: Line coding schemes, Block coding; Analog to Digital conversion: PAM and PCM, Conversion steps; Parallel and Serial transmission; Transmission Impairments; Data Rate Limits: Shanon capacity and Nyquist Bit rate; Performance Metrics; Transmission media, Modulation and Multiplexing, Spectrum Allocation.

Unit 3: The Data Link Layer

Introduction, Design Issues, Framing, Error and Flow Control, Elementary data link protocols, Sliding window protocols, SONET and ADSL. The MAC Sublayer: The channel allocation problem, MAC Protocols: ALOHA, CSMA, CSMA/CD, CSMA/ CA, Collision-Free Protocols, Bit-Map protocols, Token Passing, Binary Countdown, Wireless LAN protocols, Ethernet and its variants, 802.11 standard, Comparison between 802.11 and 3G. Switching in data link layer: Bridges, switches.

Unit 4: Network Layer

Design Issues, Implementation of Connection –oriented and connectionless services, Routing, Routing Algorithms, Shortest Path Algorithm, Flooding, Distance Vector Routing, Link state routing, Hierarchical, Broadcast and Multicast routing, Routing for mobile hosts, Ad Hoc networks, Congestion and Congestion control algorithms, Internetworking, IPV4,header and Addressing scheme, subnet and subnet creation (CIDR, Classful Addressing), NAT, IPV6, header, difference between IPV4 and IPV6, ICMP, ARP, MPLS, OSPF, BGP, Mobile IP.

Text Book:

1. Computer Networks- 5th Edition, Andrew S. Tanenbaum, David J. Wetherall, Pearson Publication

Reference Books:

1. Computer Networking, A Top Down Approach – 5th Edition, James F. Kurose, Keith W. Ross, Pearson Publication
2. Data Communication and Networking – 5th Edition, Beherouz A. Forouzan, Mc. Graw Hill Publication

Navrachana University

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Course Code: IT133
Course Name: Computer Programming - II LTPC: 2-0-0-2

Unit 1: Python Basics
Beginning Python, Lines, Comments, Names and tokens, Blocks and indentation, Program structure, Operators, Builtin datatypes, Numeric types, Tuples and lists, Strings, Dictionaries, Files; Functions and Classes

Unit 2: Statements
Assignment statement, import statement, print statement, if: elif: else: statement, for: statement, while: statement, continue and break statements, try: except: statement, raise statement, with: statement, del, case statement

Unit 3: Functions, Modules, Packages, and Debugging
Functions: The def statement, Returning values, Parameters, Arguments, Local variables, Global variables and the global statement, Doc strings for functions, Decorators for functions; Iterators and generators; Modules; Doc strings for modules; Packages.

Unit 4: GUI Applications: Tkinter
Designing User Interfaces, what is a Widget? Different Widgets: Button, Checkbutton, Entry, Frame, Label, Listbox, Menu, Message OptionMenu, Radiobutton, Scrollbar, Text; Color; Fonts; Event Handling: Event Types and Properties, Event Descriptors, Binding Callbacks to Events

Text Books:
1. CorePythonprogramming, Chun, W. 2007, Prentice Hall.
2. Python Programming: A modular approach, Taneja, S. & Kumar, Pearson

References
1. Python Programming: A step by step guide for beginners, Leonardo Eddison, Amazon Asia Pacific Holdings
2. Python: The Complete Reference, 4th Edition, Martin C. Brown, Mc Graw Hill

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Course Code: IT134
Course Name: Data Structure LTPC: 3-0-0-3

Unit-1: Introduction to Data Structures

Concept of Data Structures, Classification of Data structures – primitive and non-primitive, Linear& Non Linear Data Structures, Operations on data structures: Creation, traversal, insert, update, delete, search, sort; Algorithms: Terminologies, Performance Analysis and Measurement - Time and space analysis: Average, best and worst case analysis, notations; Applications of data structures; Programming concept: Recursion: use, advantages and limitations, Towers of Hanoi, direct and indirect recursion.

Unit-2: Linear Data Structures

Array: Definition, operations on array, time complexity of operations, Applications of arrays: sparse matrix and its representation; Linked List, types, Operations on linked lists; Stack: Stack-Definition, Representation of stack, Operations On Stacks, Applications of Stacks: Polish Expression, Reverse Polish Expression, Generating and solving PE & RPE using stack; Queue: Representation of Queue, Operations On Queue, types of Queue, Array representation of Priority Queue, Operations in a DEQUEUE, Applications of Queue; linked implementation of Stack and Queue, Applications of linked list.

Unit-3: Nonlinear Data Structures

Tree-Terminologies, Representation of binary tree, Binary tree traversal, threaded binary tree, Binary search trees, Conversion of General Trees to Binary Trees, Applications of Trees- balanced tree mechanism: AVL trees, 2-3 trees; Graph: Representation, Elementary operations: BFS, DFS; Applications of graphs: Spanning Trees Minimal spanning tree, MST algorithms: Kruskal's algorithm, Prim's algorithm, Time complexity; Shortest path: Dijkstra's Algorithm.

Unit-4: Sorting & Searching

Sorting – Concept, Bubble Sort, Selection Sort, Insertion Sort, Quick Sort, Merge Sort, Time complexity of operations; Searching – Sequential Search and Binary Search, time complexity

Text Books:

1. Data Structures using C and C++, 2nd Edition, Yedidyah Langsam, Moshe J Augenstein, Aaron M Tenenbaum, Pearson
2. Classic Data Structures- 2nd Edition, Debasis Samanta, Pretence Hall India Learning Pvt. Ltd.

References

1. Introduction to Data Structures: With Applications by Jean Paul Tremblay and Paul Gordon Sorenson, McGraw Hill Higher Education; 2nd Revised edition
2. Data Structures using C++, 2012, Varsha H. Patil, Oxford

Semester III

Navrachana University

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Course Code: ES201

Course Name: Environmental Science LTPC: 3-0-0-3

Unit 1: Basic Concepts of Environmental Science

Introduction to environment science, need of environment studies, relation of environment to IT and computer science: Current trends, precautionary principle, natural resources, renewable and non-renewable energy sources, present scenario of energy resources, bio diversity, bio diversity in India, conservation of bio diversity

Unit 2: Environmental Pollution

Concept of pollution, Global pollution: Sources and impact, Carbon footprint. Nuclear hazards

Unit 3: Solid Waste and Electronic Waste

Introduction to solid wastes, different types of solid wastes, electronic waste: a perspective to solid waste, Uses of electronic appliances, battery as a special type of electronic appliance, composition of electronic appliances and batteries, management of electronic wastes

Unit 4: Sustainable Development

Introduction to sustainable development, population as a challenge in sustainable development, renewable energy resources from a sustainable perspective, technological development for society, smart cities concept, impact of smart cities on the environment, Government regulations for environment conservation, Sustainable economics, green data centres, DNA storage

Text Books:

1. Textbook of Environmental studies for Undergraduates, 2nd Edition. Erach Bharucha
2. Environmental Science-Earth as a living planet. Daniel B. Botkin, Edward A. Keller.
3. Textbook of Environmental Science. Arvind Kumar
4. Management of Municipal Solid Waste. T.V. Ramchandra

Reference Books:

1. Handbook of climate change and India. Navroz K. Dubash
2. Conservation Biology- A primer for South Asia. Kamaljit S. Bawa, Richard B. Primack, Meera Anna Oommen.
3. Introduction to sustainability. Robert Brinkmann

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Course Code: IT221

Course Name: Analysis and Design of Algorithms LTPC: 3-0-0-3

Unit 1: Foundations

Formal definition of an algorithm, characteristics of algorithm, Analysis of algorithm: Priori Analysis, posteriori analysis, Time and space complexity analysis; Best, worst and average case analysis, designing algorithms, Growth of functions: asymptotic notations: Theta, Omega, Big O; Divide and Conqueor method: Recurences, Substitution method for solving recurences, master method for solving recurences, Probabilistic and Randomized algorithms

Unit 2: Sorting and Advanced Data Structures

Heaps, Heap sort, randomized quicksort, analysis of quicksort, counting sort, radix sort, bucket sort, Binary Search trees: randomly built BST, Red- Black Trees, B- trees: Concept, basic operations, Fibonacci heaps, Graphs: Topological sort, Single Source Shortest paths in DAG: Bellman Ford, Dijkstra's algorithm; All pairs shortest path: Floyd- Warshall algorithm, Johnson's algorithm for sparse graphs; Hash tables: Hash functions, Uniform hashing function, folding, overflow handling, probing, open addressing, hash functions; Augmenting data structures, interval trees.

Unit 3: Advanced Design and Analysis Techniques

Dynamic Programming: Rod cutting, matrix chain multiplication, longest common sub sequence, Knapsack (General and 0/1 knapsack); Greedy algorithms: activity selection problem, elements of greedy strategy, Greedy v/s dynamic programming, Huffman codes, correctness of Huffman algorithms, Knapsack Problem (General/ Greedy); Amortized analysis; Backtracking, Branch and Bound: Tape filling; Multithreaded algorithms, Linear Programming, Number- Theoretic algorithm: GCD, factorization, relatively prime numbers, String matching: Naïve string matching algorithm, Rabin Karp algorithm; Computational complexity: Introduction to NP hard and NP complete problem

Text Books:

1. Design and Analysis of Algorithms, 2014, S. Sridhar, Oxford University Press
2. Fundamentals of Computer Algorithms, 2nd Edition, Ellis Horowits, Sartaj Sahni, Sanguthevar Rajasekaran, Universities Press

Reference Books:

1. Introduction to Algorithms, 3rd edition, MIT press, Thomas H Cormen, Ronald L. Rivest, Charles E Lieserson, Clifford Stein.
2. Algorithm Design, 1st Edition, Jon Kleinberg, Eva Tardos, Pearson Education India

Navrachana University

Bachelor of Technology (Information Technology)

Course Code: CS242

Course Name: Computer Networks - II LTPC: 3-0-2-4

Unit 1: The Transport Layer

The transport service, services to upper layers and services primitives, Berkely Sockets, Elements of transport protocols, Error and Flow control, Multiplexing, Crash Recovery; Congestion control, Desirable Bandwidth Allocation, Regulating Sending rate, Wireless Issues; Internet Transport Protocols; TCP service model, Protocol, segment header, connection establishment, Connection release, Connection management modelling, sliding window, timer management, congestion control, Performance metrics, host design, header compression, Delay Tolerant networking, Bundle protocol

Unit 2: Application Layer

DNS: Namespace, Domain resource records,E-mail, Architecture and services, user agent, Message formats, MIME, SMTP, IMAP, The WWW: Architectural overview, Client side, MIME types, Server side, cookies, Static web pages' overview: HTML, CSS, Dynamic web pages and applications (overview): Server side- PHP, client side – javascript, AJAX, HTTP: connections, methods, message headers, caching, mobile web, web search, streaming audio: audio formats, compression; video: digital video formats and standards, compression, streaming stored media and live media, real time conferencing, Session Initiation Protocol, Content Delivery: Server farms, web Proxies, CDN, Peer to peer networks, Distributed Hash networks.

Unit 3: Network and Internet Security

Security goals, types of attacks, Services and Techniques; Teminologies: Plain text, cipher text, key, encryption, decryption; Confidentiality: Symmetric key ciphers, transposition ciphers, modern block ciphers: DES, Assymetric key ciphers: RSA cryptosystem; Other aspects of security: Message integrity, message digest, Hash functions; Message Authentication, Digital Signatures, Entity Authentication, Key managementAlgorithms; Network Layer security: Transport mode, comparison mode; Security protocols: Authentication Header, Encapsulating Security Payload, Services provided by IPSec; Security association; Internet Key Exchange; VPN, SSL: Architecture, protocols; E-mail security: PGP, S/MIME, Firewalls, Proxy Firewalls.

Text Book:

1. Computer Networks- 5th Edition, Andrew S. Tanenbaum, David J. Wetherhall, Pearson Publication

Reference Books:

1. Computer Networking, A Top Down Approach – 5th Edition, James F. Kurose, Keith W. Ross, Pearson Publication
2. Data Communication and Networking – 5th Edition, Beherouz A. Forouzan, Mc. Graw Hill Publication

Navrachana University

Bachelor of Technology (Information Technology)

Course Code: IT222

Course Name: Relational Database Management System LTPC: 3-0-0-3

Unit 1: Database Management System

Terminologies: data, database, DBMS, DBS, requirements from DBMS, Drawbacks of traditional file systems, View of Data: 3- tier architecture, instances and schemas, introduction to relational model, field, record, Data Independence DBMS users, DBS design and life-cycle; DBMS storage structures: Primary memory, secondary memory

Unit 2: Storage and Querying

Storage and File Structures: Overview of Physical Storage, Media RAID and RAID Levels, Basics of Indexing and Hashing; Query processing and Query Optimization

Unit 3: Data Models

Introduction to data models, ER- model, E-R diagram elements, Associative entity, Generalization and Specialization, Participation constraints, limitations and advantages of ER model. Reduction of E-R model to relational schema, Introduction to normalization

Unit 4: Transaction Management, Recovery and Security

Transaction Concept, ACID properties, Transaction Processing, Concurrency: Serializable and Non-serializable transactions, Deadlock: Avoidance and prevention, commit, rollback and save point in transaction Locks – exclusive and shared locks, 2 phase locking, Failure, Recovery and Atomicity, Log based recovery, Recovery with concurrent transactions, Ensuring Security: granting and revoking object privileges, create role, set role, assign role to user

Text Books:

1. Database System Concepts, 7th Edition, Silberschatz Abraham, Henry F. Korth, Sudarshan S, Mc Graw Hill publication.

Reference Books:

1. Database management and design, Henson and Henson
2. Oracle PL/SQL by Example,5th Edition, Rosenzwig, Pearson Education India.
3. Fundamentals of Database Systems, 5th Edition, Ramez Elmasri, Shamkant B. Navathe, Pearson Education.

Navrachana University

Bachelor of Technology (Information Technology)

Course Code: IT223
Course Name: Open Source Technologies LTPC: 2-0-0-2

Unit 1. Foundation and Terminologies

Review: Client Server model of communication, Concept of open source software, difference between open source software and freeware, Terminologies: source code, branch, fork, patch, upstreaming; Dynamic Websites, Web servers, My SQL and open Source, Introduction to PHP, Apache, My SQL and PHP (AMP module), PHP development tools and configuring XAMPP.

Unit 2. Basic Elements of PHP

Recursive Acronymn PHP, Syntax, Embedded code; Procedure Oriented Programming using PHP: comments, variables, operators, string and string manipulation, decision making, looping; arrays: associative array, functions: -User defined function, math function, string manipulation functions, array manipulation functions, date function, default argument, variable length argument, Error Handling and Debugging, Basic debugging techniques, Adjusting Error reporting. Object Oriented programming through PHP: Object, class, methods, encapsulation, accessing objects and methods: Syntax and implementation.

Unit 3: Input and File Inclusion

Handling input through HTML forms, submittingform values using $_Get and $_Post Methods, Basic input testing: Dynamic page title, Validating the user input, passing variables between pages, Concept of files: including multiple files.

Unit 4: Using MySQL with PHP

Connecting MySQL server with PHP script, design database to store information given by user, inserting, updating and modifying data in database, Introduction to PHP MyAdmin, adding constraints, Advanced topics: joins, grouping.

Unit 5: Web Application Development and Advanced Topics

Making Login Page, Login functions, handling cookies & sessions, handling file uploads, using date and time functions, paginating query results, validation of data, incorporating concept of security: Password encryption, security from scripting attacks, security from SQL injection, Incorporating JQuery with PHP

Text Books:

1. PHP for the Web: Visual Quickstart Guide, 5th Edition, Larry Ullman, Pearson Education

Reference Books:

1. PHP and MySQL Web Development, 5th Edition, Luke Welling, Laura Thomson, Pearson Education
2. PHP: The Complete Reference, 2017 Indian Edition, Steven Holzner, Mc Graw Hill Education

Semester IV

Navrachana University

Bachelor of Technology (Information Technology)

Course Code: IT226

Course Name: System Administration and Maintenance LTPC: 3-0-0-3

Unit 1: System administration

Introduction, Roles, Basics of all Windows version like NT/2000/2003 and Unix/Linux, History; File and directory layout, File Systems (NTFS, FAT, UFS), File permissions; Installing the Operating System, Basic DOS/Windows/Unix commands and tools. Command Line vs. GUI; Start up (booting) and Shutdown, Task Manager, Account Management.

Unit 2: System Processes

Scheduling jobs (scheduler/cron), job monitoring, (event viewer/ps), start and stop jobs, At command vs. Scheduled Tasks, Gui tool, Task Manager; Disk administration, File systems/partitions, Disk DeFragmentation, RAID, Basic client/server file sharing; Files, Directories and Memory Management, Permissions.

Unit 3: Networking

TCP/IP, DNS, DHCP, Domains/NIS. File Sharing. Client/Server, NFS, PDC/BDC. Active Directory, setting up a file server (and client/server network), Ethernet Addresses, Hostnames, Automating System Admin Tasks, Scripts (shell, perl C).

Unit 4: Performance Monitoring and Optimization

Control Panel and Admin Tools items, Computer Management GUI tool, Windows Update; Security and Backups; Patches, passwords, kerberos, Tools (tcpwrappers and others); Backup methods; Advanced Topics: printing, installing/upgrading hardware/software/O.S., email server, web server, dns/dhcp server, telnet/ftp/ssh, unix-windows interoperability, user communications and documentation, problems resolution and solutions, raid, SAN, NAS.

Text Book

1. UNIX and Linux System Administration Handbook, Nemeth, Snyder, Hein and Whaley, Prentice Hall, 2010.

Reference Book

1. The Practice of System and Network Administration, Limoncelli, Hogan and Chalup, Addison Wesley, 2007.

Navrachana University

Bachelor of Technology (Information Technology)

Course Code: IT227

Course Name: Probability and Statistics LTPC: 3-0-0-3

Unit 1: Foundational and Descriptive statistics

Introduction, brief history of statistics, data collection and descriptive statistics; Populations and samples; Summarizing data sets: mean, median, mode, variance, standard deviation; Co-relation between two data sets

Unit 2: Probability and Random Variables

Introduction, Terminologies: Sample space, events, Venn diagrams and algebra of events, axioms of probability, Sample spaces having equally likely outcoms, conditional probability, Bayes' theorem, Independent events; Random variables: Types, Jointly distributed random variables; Special random variables: Binomial random variables, Poisson's distribution, continuous distribution, normal distribution,Distribution of sampling statistics: Central Limit theorem, sampling distributions from normal population, sampling from finite population

Unit 3: Parameter Estimation and Hypothesis testing

Introduction, evaluating point Estimator, Interval Estimates, Confidence Interval for a Normal Mean When the Variance is Unknown, The Bayes Estimator; Hypothesis testing: Significance Levels, Tests Concerning the Mean of a Normal Population: Case of Known Variance, Hypothesis Tests Concerning the Variance of a Normal Population

Unit 4: Regression

Introduction, Least Squares Estimators of the Regression Parameters, Distribution of the Estimators, The Coefficient of Determination and the Sample Correlation Coefficient

Text Books

1. Introductory statistics by Prem S Mann, Wiley publication

Reference Books:

1. Introduction to Probability and Statistics for Engineers and Scientists, Sheldon M Ross, Elsevier.

Navrachana University

Bachelor of Technology (Information Technology)

Course Code: IT228

Course Name: Software Engineering LTPC: 3-0-0-3

Unit 1: Introduction

Introduction to software engineering, software as a product, software engineering as a process, Legacy software, Layered technology; Generic view of process, SDLC, Process models: waterfall model, linear sequential model, Prototyping model, RAD model, Evolutionary Process model: Incremental model, spiral model, concurrent development model, Requirements Engineering: bridge to design and construction, Requirement engineering tasks, Initiating requirement engineering process, Development Use case, Building Analysis model, Negotiation and Validation Requirements

Unit 2: Software Project Management

Introduction to Software project management, Software management Spectrum, The People, product & process, W5HH principle, Software Project Estimation, measures, metrics and indicators, Software Scope & Feasibility, decomposition Techniques, Risk analysis and Management, risk mitigation, risk monitoring, Introduction of Project Scheduling, Basic principles of Project Scheduling, making timeline charts, tracking charts, earned value analysis, error tracking

Unit 3: Software Quality Assurance

Definition of software quality, quality control, Quality Management, Software Quality Assurance, SQA activities, Defects in software, cost impact of software defects, technical reviews, Software reliability, measures of software reliability, software safety, Quality standards, SQA plans, Software configuration Management, SCM process

Unit 4: Software Testing and Maintenance

Fundamentals, principles, processes, designing test cases, White Box and black box testing, Cyclomatic complexity, Control structure testing, unit testing, integration testing, Validation testing, stress and performance testing, Debugging processes and approaches, Component based software testing, Re-engineering; Software maintenance, preventive maintenance, corrective maintenance, adaptive maintainence, perfective maintenance, cost of maintenance

Text Books

1. Fundamentals of Software Engineering, 5th Edition, Rajib Mall, PHI learning
2. Software Engineering, 10th Edition, Ian Sommerville, Pearson Education

Reference Books:

1. Software Engineering: A Practioner's Approach, 8th Edition, Roger S. Pressman, Bruce Maxim, Mc. Graw Hill Edition

Navrachana University

Bachelor of Technology (Information Technology)

Course Code: IT229

Course Name: Operating System Concepts LTPC: 3-0-0-3

Unit 1: Introduction

Operating system introduction, types; Terminologies: Processes, address space, files, input/output, the shell, System calls for process management, file management, directory management, miscellaneous; OS structure: Monolithic, Layered systems, Microkernels, Client-server, Virtual machines, Exokernels.

Unit 2: Processes, Threads and Memory

Process: The process model, creation, termination, hierarchies, states, implementation; Threads: Thread usage, classical thread model, POSIX thread, multithreading; Interprocess communications: Race condition, critical region, mutual exclusion methods; Scheduling in processes and threads; Classical IPC problems; Memory: Address space, swapping, free memory, virtual memory: paging, page tables; Page replacement algorithms; Design issues; Segmentation.

Unit 3: File Systems, Input Output and Resource Allocation

File Systems: File naming, structure, access, attributes, operations, single and hierarchical directory systems, virtual file systems, Disk space management, file system backups, consistency, performance and defragmenting; I/O devices, Device controllers, Memory mapped I/O, DMA, Interrupts, device drivers, Disk hardware and formatting, disk arm scheduling, Error handling, stable storage, Clock hardware and software, Thin client, power management; Resource Allocation: Preemptable and non preemtable resources, resource acquisition, Deadlock modelling, Deadlock avoidance and prevention, Locking protocols

Unit 4: Advanced Topics and Case study

Introduction to multimedia encoding and compression, caching, block caching, file caching, disk scheduling for multimedia, Overview of multiprocessors and multicomputers, virtualization; Hypervisor; Security, Case study: Linux, a brief history, Goals, the shell, utility programs, processes, system calls and system booting, memory management system calls, i/o system calls, NFS, file system calls, implementation of security; Design principles of operating system

Text Books:

1. Mordern Operating Systems, 4th Edition, Andrew S. Tanenbaum, Herbert Bos, Pearson Education India

Reference Books:

1. Operating System Concepts, 7th Edition, Abraham Silberschatz, Peter B. Galvin, Greg Gagne, Wiley
2. Operating Systems: Internals and Design Principles, 9th Edition, William Stallings, Pearson Education

Navrachana University

Bachelor of Technology (Information Technology)

Course Code: IT230

Course Name: Object Oriented Programming LTPC: 3-0-0-3

Unit-1: Introduction

Overview of Object Oriented Concepts, Features of Java language, Data Types, Type Conversion and Casting, Class Fundamentals, Constructors, this keyword, Garbage Collection, Method Overloading, Constructor Overloading, Introducing Access Control, String Class in Java, Using Command-Line Arguments, Varargs: Variable-Length Arguments

Unit-2: Inheritance, Packages, Interfaces, Exception, Multithreading

Inheritance Basics, using super, Method Overriding, Abstract Classes, Packages, defining a Package, Access Protection, Importing Packages, Interfaces, defining an Interface, Implementing Interfaces, Partial Implementations, Exception Handling, using try and catch, throw, throws, Java's Built-in Exceptions, Multithreaded Programming, Java Thread Model, Thread Class and the Runnable Interface, Creating a Thread, Thread Priorities

Unit-3: Java I/O, Collection Framework

Java I/O Basics, File Class, Byte Stream and Character Stream Classes, Reading Console Input, Reading Characters, Reading Strings, Writing Console Output, Reading and Writing Files, Collections Overview, Collection Interfaces, Collection Classes, Accessing a Collection via an Iterator

Unit-4: GUI Programming

Applet vs Application, Swing Basics, Swing Graphics: Graphics, Icon, Containers: JApplet, JFrame, JWindow, JDialog, JPanel. Controls: JButton, JTextField, JTextArea, JTextPane, JCheckBox, JRadioButton, JComboBox, JList, JPasswordFied, JSlider, JProgressBar, JTabbedPane, JMenu. Controlling Layouts: BorderLayout, FlowLayout, CardLayot. Dialog boxes: JOptionPane, JPopupMenu, JDialog, JFileChooser.

Text Book:

1. Schildt, H. (2018). Java: The complete reference. New York: McGraw-Hill Education
2. Arnold, K., & Gosling, J. (1998). The Java programming language. Reading, MA: Addison-Wesley

Reference Book:

1. Horstmann, C. S. (2016). Core Java. Fundamentals. Boston: Prentice Hall
2. Eckel, B. (2000). Thinking in java. Upper Saddle River: Prentice Hall PTR

Navrachana University

Bachelor of Technology (Information Technology)

Course Code: IT231

Course Name: .Net Technology - I LTPC: 2-0-0-2

Unit 1: Overview of .NET Framework and Basics of C# language

General .NET Framework architecture, .NET features, the Common Language Runtime (CLR), The .NET Framework class library, Visual Studio .NET IDE 2013, C# language fundamentals: datatypes, variables, expressions, classes and objects, object-oriented concepts, arrays, strings and regular expressions and exception handling, System. Exception class. This keyword, indexers, delegates, properties, Meta Data and reflection API, structure, enumeration.

Unit 2. Programming in Visual basic .net/Console Application.

IDE, Variables and Data Types, Boxing and Unboxing, Enumerations, Data Type Conversion Functions, Statements, String & Date Functions and Methods, Modules, Procedures and Functions, passing variable number of arguments, Optional arguments, Using Arrays and Collections, Control Flow Statements, Conditional Statements, Loop Statements, MsgBox and InputBox

Unit 3. Introduction to Windows controls

Working with Tool Box Controls, Common controls - Label, Text Box, Button, Check Box, Radio Button, Date Time Picker, List Box, Combo box, Picture Box, Rich Text Box, Tree View, Tool Tip, Progress bar, Masked Text box, Notify Icon, Link Label, Checked List box, Container Controls, Data - Data Set, Data Grid, Component - Image list, error provider, help provider, Timer, Working with Menus and Dialogue Boxes, Exception Handling, Structured Error Handling, Unstructured Error Handling

Unit 4: Building windows forms applications using ADO.NET

ADO.net architecture: connected and disconnected, Difference between classic ADO and ADO.net, ADO characteristics, classes and objects, .net data providers, record navigation with localDB, CRUD operations, ms. Access database connectivity, MYSQL connectivity, Windows forms fundamentals, creating windows form applications, adding controls to forms, Connectivity with Database.

Text Books:

1. Karli Watson, Beginning Microsoft Visual C# 2008, Wrox (2008 edition)
2. Herbert Schildt, the complete reference C# 4.0

Reference Books:

1. Visual Basic .NET Programming (Black Book) - By Steven Son Holzner, DreamTech Publication
2. Mastering Visual Basic.NET by Evangelos Petroutsos BPB Publication
3. Moving to VB.NET: Stategies, Concepts, and Code - by Dan Appleman – Apress