Navrachana University

Bachelor of Technology

(Informaton Technology)

Detailed Curriculum

2018-2022

Semester - 1

Course Code	Course Title	L	T	P	Credits
MA140	Discrete Mathematics	3	0	0	3
EL101	Introduction to Electronics	3	0	3	4.5
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
DW105	Free Hand Drawing	0	0	2	1
CT101	Critical Thinking and Reading	0	0	2	1
IT126	Applications of CP-I	0	0	6	3
IT128	Applications of WD	0	0	4	2
		Total Credits			**24.5**

Semester - 2

Course Code	Course Title	L	T	P	Credits
IT131	Digital Logic Design	3	0	0	3
IT132	Computer Networks	3	0	0	3
IT133	Computer Programming – II	3	0	0	3
IT134	Data Structure and Algorithms	3	0	0	3
IT135	Database Management System	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	6	3
IT139	Applications of DSA	0	1	2	2
IT140	Applications of DBMS	0	0	4	2
	Interdisciplinary course	2	0	0	2
		Total Credits			**25**

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			**23**

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**

4 weeks summer Corporate Internship of 2 credits after semester - IV

Semester - 5

Course Title	L	T	P	Credits
Manual Testing methods	3	0	0	3
Data Modeling & Analysis	2	1	0	3
Data Warehousing and Data Mining	3	0	3	3
Open Source Technologies	2	0	0	2
Cloud Computing Applications	3	0	0	3
Mobile and Wireless Networks	3	0	0	3
Cloud Computing Basics	3	0	0	3
Applications of Cloud Computing	0	0	4	2
Applications of OST	0	0	4	2
Critical Thinking and Reading-V	0	0	2	1
Interdisciplinary course	2	0	0	2
Total Credits				**27**

Semester –6

Course Title	L	T	P	Credits
Functional Automated Testing	2	0	0	2
Business Analysis	3	0	0	3
Distributed Databases	2	0	0	2
Network Security	2	0	0	2
Advanced Java Concepts	3	0	0	3
Advanced .NET Concepts	2	0	0	2
Applications of Functional Testing	0	0	4	2
Applications of Advanced Java Concepts	0	0	4	2
Applications of Advanced .NET Concepts	0	0	4	2
Critical Thinking and Reading-VI	0	0	2	1
Total Credits				**21**

4 weeks summer Industrial Internship of 2 credits after semester - VI

Semester - 7

Course Title	L	T	P	Credits
Non-functional Automated Testing	2	0	0	2
Elective • Big Data & Analytics • Database Administration	3	0	0	3
Open Source Frameworks	3	0	0	3
Artificial Intelligence	3	0	0	3
Emerging IT Trends (two electives) • Big Data • Automotion and Robotics • Machine Learning • Information Security	3 3			3 3
Applications of Non-functional Testing	0	0	4	2
Applications of OSF	0	0	4	2
Elective • Applications of Big Data & Analytics • Applications of DBA	0	0	4	2
Critical Thinking and Reading-VII	0	0	2	1
Total Credits				**24**

Semester –8

Course Title	L	T	P	Credits
Full Semester Industrial Internship				20
Independent study				2
Critical Thinking and Reading-VIII	0	0	2	1
Total Credits				**23**

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	24.5
Sem-II	25
ScoialInternship	2
Sem-III	23
Sem-IV	21
IndustrailInternship - I	4
Sem-V	27
Sem-VI	21
IndustrailInternship – II	4
Sem-VI	24
Sem-VIII	23
Total	188.5
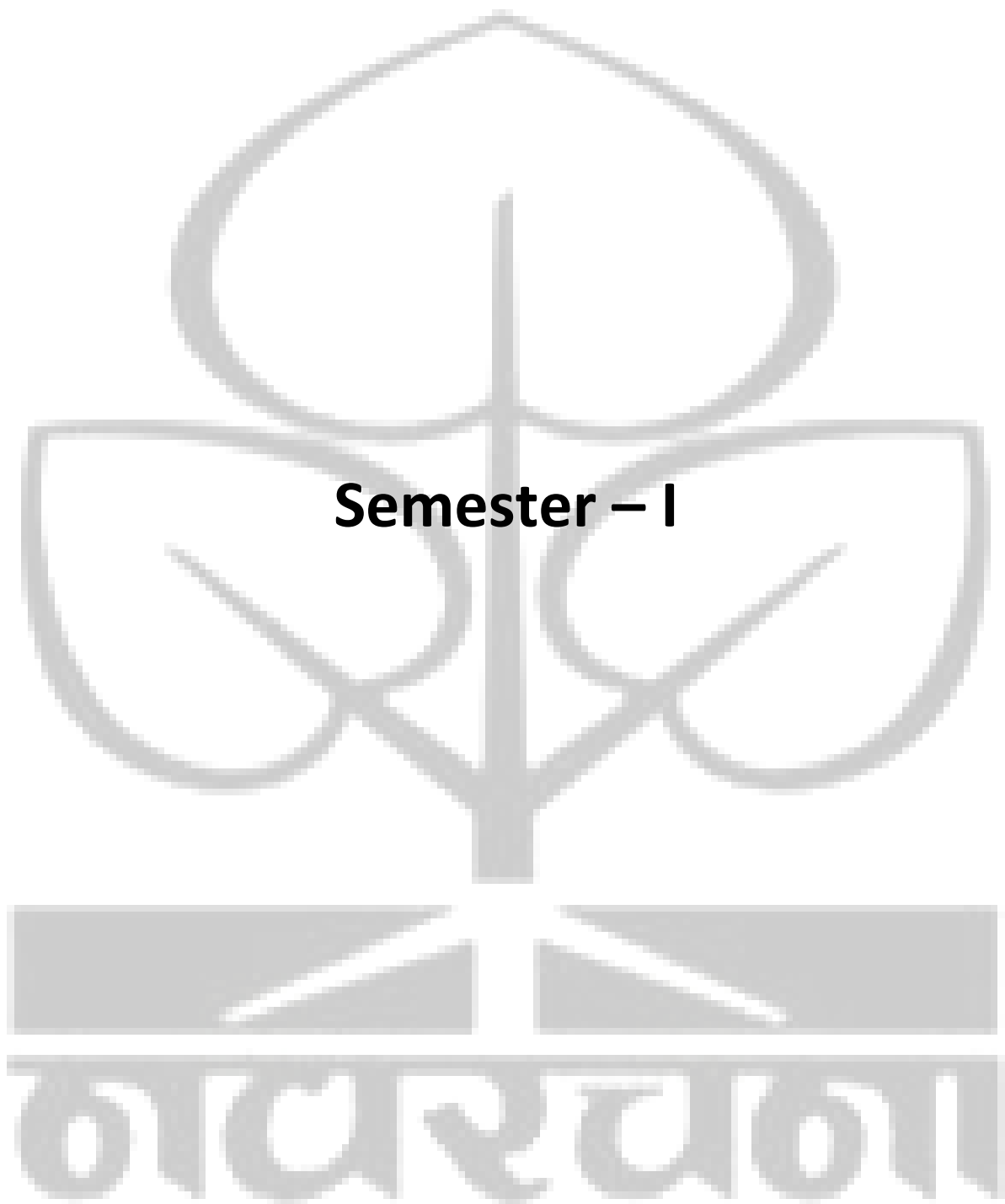
Semester – I

Navrachana University

Bachelor of Technology (Information Technology)

Course Code: MA140
Course Name: Discrete Mathematics   LTPC: 3-0-0-3

Unit-1: Matrices
Determinants: Basic properties, Minors, Cofactors; Matrices: Definition, Types of Matrices, Addition, Subtraction, Scalar Multiplication and Multiplication of Matrices, Adjoint and Inverseof a matrix. Solving systems of linear equations

Unit-2: 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

Unit-3: Algebra& Boolean Algebra
Relations and ordering: Properties of binary relations, graph and matrix representation of binary relation, equivalence relation, composition of binary relations, partial ordering, partiallyordered sets;
Basic operations- Boolean expressions & truth tables- Basic theorems- Commutative- Associative & Distributive laws - Simplification theorems Multiplying out & factoring- Inversion- Duality- Exclusive-or & equivalence operations- Positive & negative logic.

Unit-4: 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

Text Book:
1. Discrete mathematics and its applications (4th 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)

Navrachana University

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Course Code: EL101
Course Name: Introduction to Electronics   LTPC: 3-0-3-4.5

Unit – 1: PN Diode and its Applications:
PN junction diode, VI characteristics, switching device, Rectifiers: HWR, FWR, BR, filters, Zener diode – VI characteristics, Regulators (series and shunt), Special purpose diodes ad their applications, clippers, clampers

Unit – 2: BJT and its Applications:
Junction transistor, Transistor construction, Input and output characteristics – CE, CB and CC configurations – Analytical expressions, transistor as an amplifier, switching, RF applications, Power transistors , Opto-couplers.

Unit – 3: FET and its Applications:
FET – VI characteristics, JFET – small signal model – LF and HF equivalent circuits – CS and CD amplifiers – MOSFET - Characteristics –enhancement and depletion.

Unit – 4: Amplifiers and Oscillators:
Introduction to Op- Amp, Differential amplifiers: CM and DM, Op Amp applications, feedback amplifiers, stability, voltage /current, series / shunt feedback, oscillators – LC, RC, crystal, multivibrators.

Text Book:
1. Robert T. Paynter, "Introductory electronic devices and circuits, 2006, PHI
2. David Bell "Electronic Devices and Circuits" 2007, PHI

Reference Books:
1. Theodore F. Bogart, "Electronic Devices & Circuits" Pearson Education, VI Edition, 2003
2. Rashid, "Microelectronic circuits" Thomson Publication, 1999
3. 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:
Introduction & Internet Trends, Traditional Internet Applications, Transmission Media, Reliability and Channel Coding, Transmission Modes, Multiplexing and De-multiplexing
Networking models: TCP/IP and ISO/OSI, Layers and functions of layers, protocols in layers.
LAN: types, packets, Frames, & Topologies, Access & Interconnection Technologies, UDP: Datagram Transport Service, TCP: Reliable Transport Service

Unit 2:
Networking devices: Repeaters, Bridges, Hubs, Switches, Gateways. The IEEE MAC Sub-Layer, Wired LAN Technology, Wireless Networking Technologies, WAN Technologies and Dynamic Routing
IP: Internet Addressing – IPv4, IPv6. Multiple Access protocols, Datagram Forwarding, Support Protocols, Internet Routing and Routing Protocol, Network Security

Text Books:
1. Introduction to Networking: How the Internet Works by Dr. Charles R Severance
2. Data Communications And Networking (SIE) by Behrouz A. Forouzan

Reference Books:
1. Introduction to Computer Networks and Cybersecurity by Chwan-Hwa (John) Wu, J. David Irwin. CRC Press

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 of a computer system, Von Neumann Architecture, Components of a computer System: Central Processing Unit, Input Output devices, Memory: Primary Memory and Secondary Memory, Peripheral devices, Concepts of hardware and software, Types of software: System Software, Application software, general purpose software and special purpose software. User Interface, Evolution of computer system. PC Assembling. Applications of computer system in everyday life, Computer science field, Job or Enterprneurship opportunities in computer science

Unit-2: Internals of computer system
Understanding Central Processing Unit: components of a CPU, Motherboard, Microprocessor basics, Evolution of, ROM, RAM and their types, flash memories, printers, graphics and multimedia. Introduction to Operating System: Command Line based, and GUI based operating system, Operating system setup, using common icons, running an application making files, concept of file extension, folders, hierarchy of folders, renaming files and folders, introduction to app based computer systems

Unit-3: Word Processing software, Presentation software and Spreadsheets
Word processing basics, creating word documents and manipulation: formatting word documents, format painter, altering design of a document, handling tables, spelling check and thesaraus, mail merge. Presentation software: Creating and saving presentations, adding customized designs, templates and animations. Spreadsheet software: Basics of spreadsheet manipulation, formulas for manipulating data values in spreadsheets, macros

Unit-4: Introduction to web browsers, Internet and Office 365.
Internet and WWW, communication over the internet: Client - Server model. Introducing office 365 apps: Word online, Excel online, Powerpoint online, one note, Sway. E-mail app Ms Outlook: configuring Ms Outlook, Sending and receiving e-mails through Ms- Outlook

Text Book:

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

Navrachana University

Bachelor of Computer Applications

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

Unit 1:
Introduction to problem, different problem-solving techniques: flowchart, algorithm, pseudo code, Introduction to Programming, Basic features of C language like identifiers, keywords, variables, data types, operators, Operator precedence and associatively, Storage Classes: automatic, register, static and external.

Unit 2:
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.

Unit 3:
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. Structures: Purpose and usage of structures, declaring structures, assigning of structures.

Unit 4:
Functions: Concept of modular programming, using functions, passing arguments by value, scope rules and global variables, Recursive functions.
Pointers: Types and use of pointers, Array and Pointers, Pointers and Strings, Pointer and address arithmetic, using pointers as function arguments.

Text Books:
1. Problem Solving and Program Design in C, by Jeri R. Hanly, Elliot B. Koffman, Pearson Addison-Wesley, 2006.
2. Programming in ANSI C, by Balagurusamy, Publisher - Tata McGraw Hill.

Reference Books:
1. Brian W. Kernighan, Dennis M. Ritchie, The C Programming Language: Ansi C, Version 2 Edition, PHI Learning (2012)

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Course Code: IT127

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

Unit-1: What is HTML? Basic Tags of HTML: HTML Tag, TITLE Tag, And BODY Tag, Formatting of Text:Headers, Formatting Tags, PRE Tag, FONT Tag, Special Characters, Working with Images, METATag

Links: Anchor tag; Lists: Unordered Lists, Ordered Lists, Definition Lists; Tables: TABLE, TR and TD Tags, Cell Spacing and Cell Padding, Colspan and Row span; Frames: Frameset, FRAME Tag,NOFRAMES Tag; Forms: FORM and INPUT Tag, Text Box, Radio Button, Checkbox, SELECT Tag and Pull Down Lists, Hidden, Submit and Reset; Some Special Tags: COLGROUP, THREAD, TBODY,TFOOT, _blank, _self, _parent, _top, IFRAME, LABEL, Attribute for <SELECT>, TEXTARE.

Unit-2: What is CSS? Linking CSS in your HTML document; Creating class, ids; Display and arrangementof elements using CSS; Margin and padding property; Font property JavaScript Variables and Data Types: Declaring Variables, Data Types; Statements and Operators; Control Structures: Conditional Statements, Loop Statements; Object-Based Programming: Functions, Executing Deferred Scripts, Objects; Message box in JavaScript: Dialog Boxes, Alert Boxes, Confirm Boxes, Prompt Boxes; JavaScript with HTML: Events, Event Handlers; Forms: Forms Array

Unit-3: Introduction to jquery,difference between javascript and Jquery,JqueryEvents,Selectors,Effects,Traversing, Properties,using Jquery with html/css, responsive websites.Introduction to Content management Sytems: wordpress,Drupal.

Unit-4: Document StructureChanges, Adding Semantics, HTML5's Open Media Effort, Client-Side Graphics with <canvas>, HTML5 Form Changes, Emerging Elements and Attributes to SupportWeb Application

Text Books:
1. Ivan Bayross, Web Enabled Commercial Application Development Using HTML, DHTML,JavaScript, Perl CGI, 3rd Edition, and BPB Publication
2. Thomas A Powel, The Complete Reference: HTML &CSS,JQuery 5ed
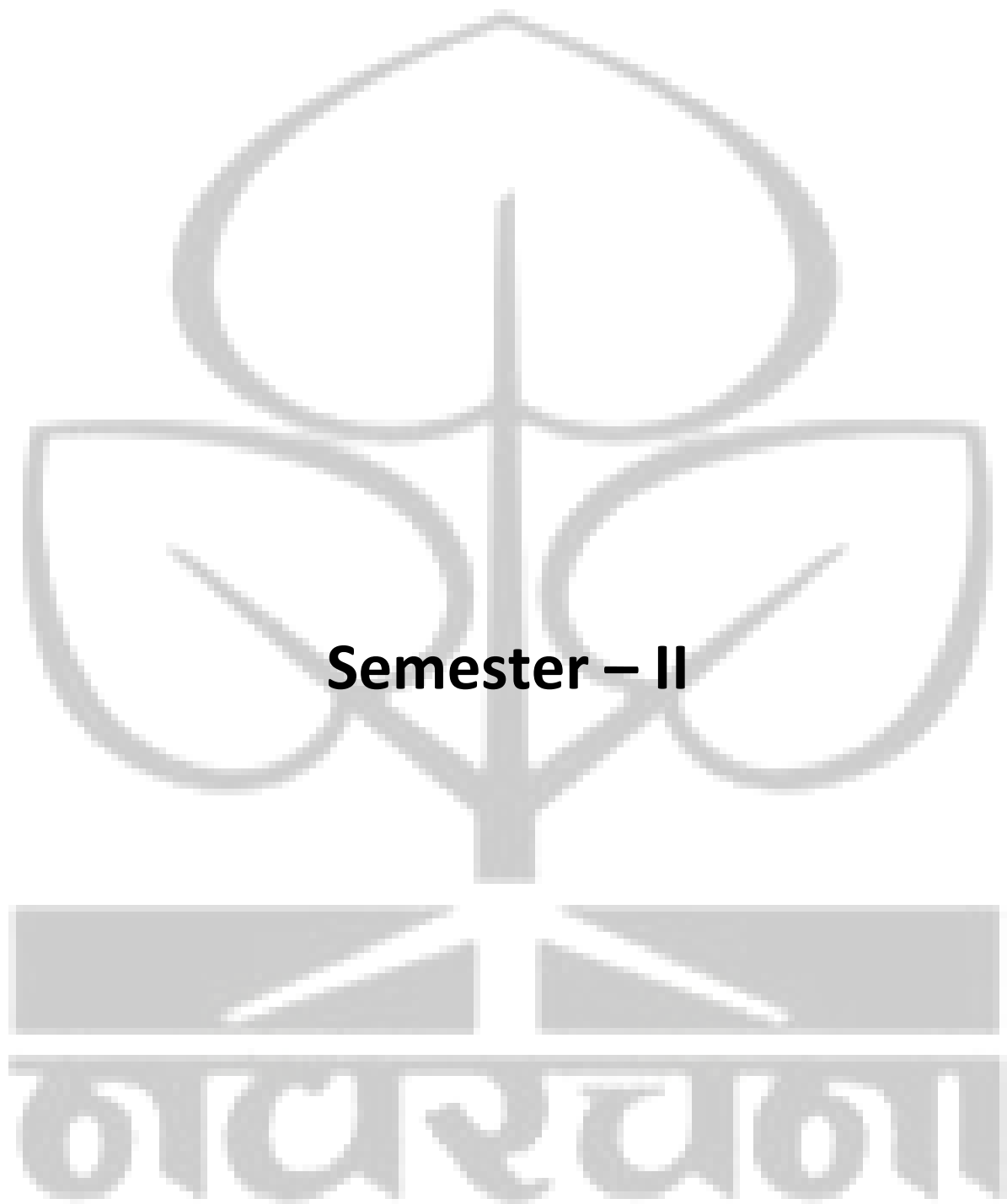
Semester – II

Navrachana University

Bachelor of Technology (Information Technology)

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

Unit-1: Number Systems & Boolean Algebra
Digital Number Systems: Binary, Octal,Hexadecimal; Number System Conversion; Binary Codes: Weighted vs Non-Weighted Codes, Excess-3 Code, Gray Code, Binary Coded Decimal (BCD) code; Error Codes: Error Detection and Correction, Parity bit, Hamming Code. Binary Arithmatic, Boolean Algebra: Boolean Laws, Truth table formation, De morgan's theorem, Simplification & K-map, SOP & POS forms, Integer representations: 1's complement & 2's complement, Floating point representations: IEEE floating point, Character: ASCII & Unicode

Unit-2: Logic Gates & Combinational Circuits
Basic gates: AND, OR, NOT; Universal gates: NOR, NAND, Other gates: XOR, XNOR; Adders: Half, Full, Parallel binary adder, BCD adder; Sutractors: Half, Full; Multiplexer, Demultiplexer, Encoder, Decoder

Unit-3: Sequential Circuits & Memory
Flip flops: SR, D, JK, T; Register: Shift, Counters: Asyncronous Ripple counter, Up/Down counter, Mod-N counter, Programable counter, Ring counter; RAM, SRAM, DRAM, ROM, PROM, EPROM, EEPROM, Serial Access, Direct Access, Cache memory

Unit-4: Computer Architecture
Traditional Von Neumann machine, Basic instruction sent, Instructionand flow of control, Parallel Processing: SISD, SIMD, MIMD

Text Books:
1. Malvino, A. P. (2011). Digital computer electronics. New Delhi: Tata Mcgraw Hill Education Pvt Ltd
2. Mano, M. M. (1993). Computer system architecture. Englewood Cliffs, NJ: Prentice Hall

Reference Books:
1. Jain, R. P. (2010). Modern digital electronics. Boston: McGraw-Hill Higher Education
2. Leach, D. P., Malvino, A. P., &Saha, G. (2015). Digital principles and applications. New Delhi: McGraw Hill Education

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Course Code: IT133

Course Name: Computer Programming - II   LTPC: 3-0-0-3

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:
3. Chun, W. (2007). *Core Python programming.* Upper Saddle River, NJ: Prentice Hall.
4. Taneja, S., & Kumar, N. (n.d.). *Python Programming: A modular approach* by Pearson. Pearson.

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Course Code: IT134

Course Name: Data Structure and Algorithms   LTPC: 3-0-0-3

Unit-1: Introduction to Data Structures
Data Management concepts, Data types – primitive and non-primitive, Performance Analysis and Measurement (Time and space analysis of Algorithms-Average, best and worst case analysis), Types of Data Structures- Linear & Non Linear Data Structures.

Unit-2: Linear Data Structure
Array: Representation of arrays, Applications of arrays, sparse matrix and its representation
Stack: Stack-Definitions & Concepts, Operations On Stacks, Applications of Stacks, Polish Expression, Reverse Polish Expression and Their Compilation, Recursion, Tower of Hanoi
Queue: Representation of Queue, Operations On Queue, Circular Queue, Priority Queue, Array representation of Priority Queue, Double Ended Queue, Applications of Queue
Linked List: Singly Linked List, Doubly Linked list, Circular linked list, linked implementation of Stack, Linked implementation of Queue, Applications of linked list.

Unit-3: Nonlinear Data Structure
Tree-Definitions and Concepts, Representation of binary tree, Binary tree traversal (Inorder, postorder, preorder), Threaded binary tree, Binary search trees, Conversion of General Trees To Binary Trees, Applications of Trees-Some balanced tree mechanism, eg. AVL trees, 2-3 trees, Height Balanced, Weight Balance, Graph-Matrix Representation Of Graphs, Elementary Graph operations (Breadth First Search, Depth First Search, Spanning Trees, Shortest path, Minimal spanning tree)

Unit-4: Sorting & Searching
Sorting – Bubble Sort, Selection Sort, Insertion Sort, Heap Sort, Quick Sort, Merge Sort
Searching – Sequential Search and Binary Search

Text Books:
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 through C in Depth, S.K. Srivastava – Deepali Srivastava, BPB Publications

Semester III
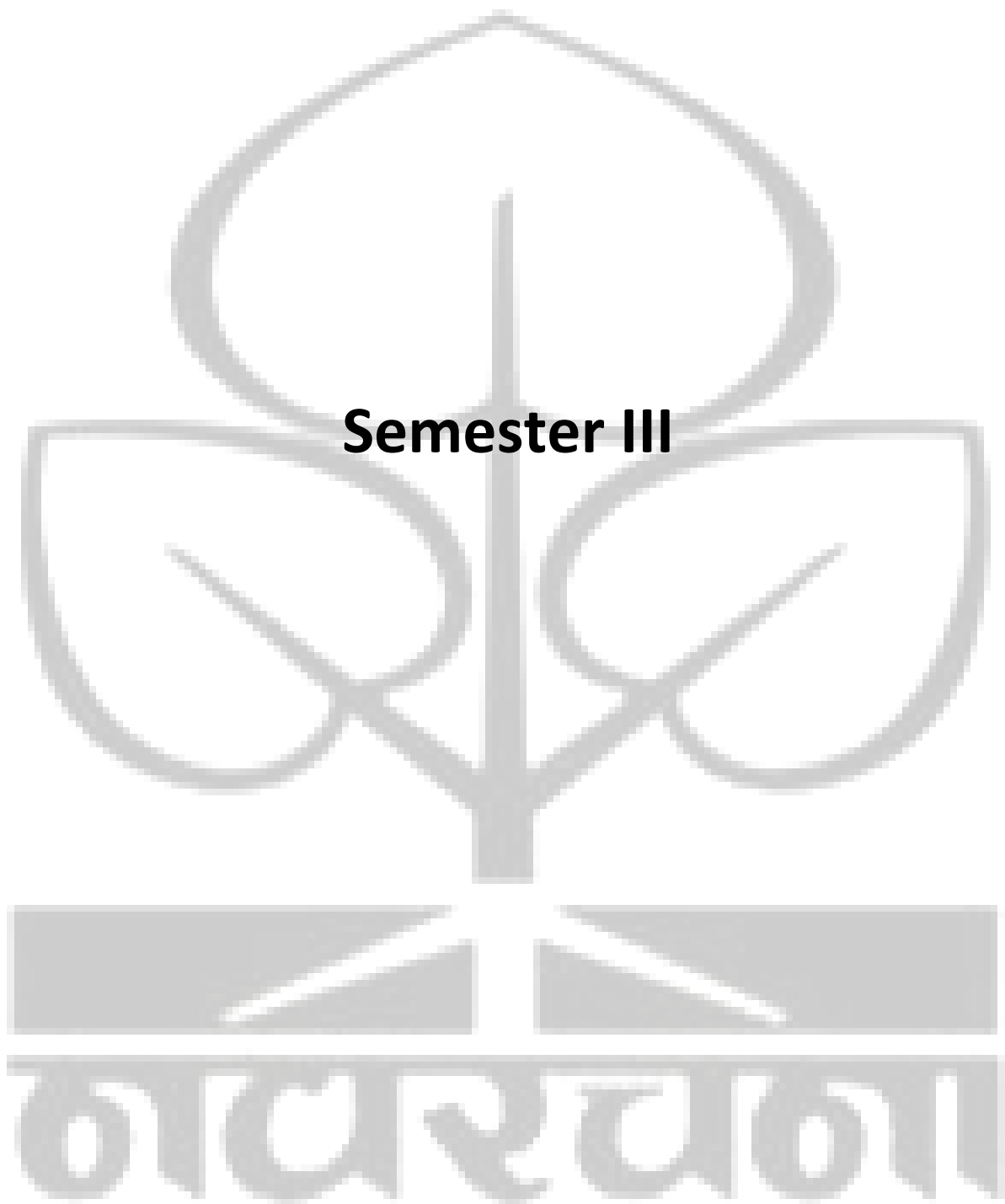
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Bachelor of Technology (Information Technology)

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. ErachBharucha
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, SanguthevarRajasekaran, 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

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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

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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, RamezElmasri, Shamkant B. Navathe, Pearson Education.

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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: PHP code embedded within HTML script; Procedure Oriented Programming using PHP:comments, variables, operators, string and string manipulation, decision making, looping: while, do while, for, for each; 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 in PHP. 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 through code.

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: 2-0-2-3

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, implementing thread, multithreading; Interprocess communications: Race condition, critical region, mutual exclusion methods; Scheduling: scheduling in processes and threads; Classical IPC problems; Memory: Address space, swapping, free memory, virtual memory: paging, page tables; Page replacement algorithms; Design issues for page replacement; Segmentation.

Unit 3: File Systems, Input Output and Resource Allocation
File Systems: File naming, structure, access, attributes, operations, single and hierarchical directory systems, path names and directory operations, implementation, virtual file systems, Disk space management, file system backups, consistency, performance and defragmenting; I/O devices, Device controllers, Memory mapped I/O, Direct memory access, 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, Deadlocks: Deadlock modelling, Deadlock avoidance and prevention, 2 phase locking, livelock, communication deadlocks, starvation.

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 andmulticomputers, virtualization; Hypervisor; Security: The security environment, authentication; 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 EvangelosPetroutsos BPB Publication
3. Moving to VB.NET: Stategies, Concepts, and Code - by Dan Appleman – Apress