Kazi Nazrul University

Curriculum
for
B. Sc.(Honours) in Computer Science

Six Semester Course Under Choice Based Credit System

(With effect from 2016-2017 academic session)

B.Sc.(Honours) in Computer Science FirstSemester					
Course Type	**Course Title**	**Course Code**	**(L-T-P)**	**Credit**	**Marks**
Core	Computer Fundamentals	Core-I	5 - I - 0	6	50
Core	Programming in C	Core-II	4-0-0	4	50
Core Practical	Programming in C Laboratory	Core-II Practical	0- 0 - 4	2	50
Generic Elective	**From Other Discipline**	GE-I	Only Theory or Theory+ Practical/Tutorial	6 or 4/5+2/1	50 or 50+50
AECC	Environment Studies	AECC-I	4 - 0 - 0	4	50
			SEMESTER TOTAL:	22	250 /300

B.Sc. (Honours) in Computer Science SecondSemester					
Course Type	**Course Title**	**Course Code**	**(L-T-P)**	**Credit**	**Marks**
Core	Operating System	Core-III	5- 1- 0	6	50
Core	Data Structure	Core-IV	4-0-0	4	50
Core Practical	Data Structure Laboratory	Core-IV Practical	0 – 0- 4	2	50
Generic Elective	**From Other Discipline**	GE-II	Only Theory or Theory+ Practical/Tutorial	6 or 4/5+2/1	50 or 50+50
AECC	English	AECC-II	2 - 0 - 0	2	50
			SEMESTER TOTAL:	20	250 /300

B.Sc. (Honours) in Computer Science ThirdSemester					
Course Type	**Course Title**	**Course Code**	**(L-T-P)**	**Credit**	**Marks**
Core	Computer Architecture & Organization	Core-V	5 - I - 0	6	50
Core	Formal Language	Core-VI	5-1-0	6	50
Core	Digital Logic	Core-VII	4 – 0- 0	4	50
Core Practical	Digital Logic Laboratory	Core-VII Practical	0- 0 - 4	2	50
Generic Elective	**From Other Discipline**	GE-III	Only Theory or Theory+ Practical/Tutorial	6 or 4/5+2/1	50 or 50+50
Skill Enhancement Course	**Any One:** i. Fundamentals of Information & Communication Technology ii. System Analysis and Design.	SEC-I	2 - 0 - 0	2	50
			SEMESTER TOTAL:	26	300/350

B.Sc. (Honours) in Computer Science FourthSemester					
Course Type	**Course Title**	**Course Code**	**(L-T-P)**	**Credit**	**Marks**
Core	Software Engineering	Core-VIII	5-1-0	6	50
Core	Computer Networks	Core-IX	5 - 1-0	6	50
Core	Database Management System	Core-X	4 - 0- 0	4	50
Core Practical	DBMS Laboratory	Core-X Practical	0 - 0- 4	2	50
Generic Elective	**From Other Discipline**	GE-III	Only Theory or Theory+ Practical/Tutorial	6 or 4/5+2/1	50 or 50+50
Skill Enhancement Course	**Any One:** i. UNIX& Shell Programming Lab ii. Web Technology Lab	SEC-II	0 - 0 - 4	2	50
			SEMESTER TOTAL:	26	300/350

B.Sc. (Honours) in Computer Science FifthSemester					
Course Type	**Course Title**	**Course Code**	**(L-T-P)**	**Credit**	**Marks**
Core	Computer Graphics	Core-XI	4 -0 - 0	4	50
Core Practical	Computer Graphics Practical using C	Core-XI Practical	0 – 0 - 4	2	50
Core	Object Oriented Programming with C++	Core-XII	4 - 0 - 0	4	50
Core Practical	C++ Laboratory	Core-XII Practical	0 -0 -4	2	50
Core Elective	**Any One:** i. Analysis of Algorithms ii. Advance Database Management System	DSE-I	5 - I - 0	6	50
Core Elective	**Any One:** i. Compiler Design ii. Artificial Intelligence	DSE-II	5 - I - 0	6	50
			SEMESTER TOTAL:	24	300

B.Sc. (Honours) in Computer Science SixSemester					
Course Type	**Course Title**	**Course Code**	**(L-T-P)**	**Credit**	**Marks**
Core	Core Java	Core-XIII	4 – 0 -0	4	50
Core Practical	Java Laboratory	Core-XIII Practical	0 – 0 - 4	2	50
Core	Microprocessor	Core-XIV	4 - 0 - 0	4	50
Core Practical	Microprocessor Laboratory	Core-XIV Practical	0 - 0 - 4	2	50
Core Elective	**Any One:** i. Optimization Techniques ii**.** Advance Computer Architecture iii. Animation & Multimedia	DSE-III	5 - I - 0	6	50
Core Elective	**Any One:** i. Cryptography & Network Security ii. Mobile Ad-hoc Network iii. Soft Computing	DSE-IV	5 - I - 0	6	50
			SEMESTER TOTAL:	24	300
			GRAND TOTAL:	142	1700/1900

N.B.**For theory papers – Internal Assessment: 10 and Final Examination: 40.**
For Practical papers - Internal Assessment: 30 and Final Examination: 20.

B.Sc. (Honours) in Computer Science FirstSemester

Course Title: Computer Fundamentals **CREDITS: 6**
Course Code: Core-I **CONTACTS: 5L+1T**

Introduction:Introduction to Computer and Problem Solving: Information and Data.
Hardware: CPU, Primary and Secondary storage, I/O devices, Bus structure
Software: Systems and Application.
Generation of Computers: Super, Mainframe, Mini and Personal Computer.
Introduction to Programming Languages: Machine Language, Assembly Language, High Level Language.
Problem Solving: Flow Charts, Decision Tables and Pseudo codes.
Number Systems and Codes: Number representation: Weighted Codes, Non-weighted codes, Positional, Binary, Octal, Hexadecimal, Binary Coded Decimal (BCD), Conversion of bases. Complement notions. Binary Arithmetic, Binary Codes: Gray, Alphanumeric, ASCII, EBCDIC; Single Error-Detecting and Correcting Codes, Hamming Codes.
Boolean algebra: Fundamentals of Boolean algebra, Switches and Inverters, Functionally Complete Gates (AND, OR, NOT), NAND, NOR, Switching function and Boolean Function. De Morgan's Theorem, Minterms, Maxterms, Truth table and minimization of switching function up to four variables, Algebraic and K-map method of Logic circuit synthesis: Two-level and Multi-level.

Recommended Books:

1. Digital Logic and Computer Design by M.Morris Mano, PHI
2. Modern Digital Electronics : R.P. Jain

Course Title: Programming in C **CREDITS: 4**
Course Code: Core-II **CONTACTS: 4L**

Introduction: Basic Structure, Character sets, Keywords, Identifiers, Constants, Variables, Data Types, Program Structure.
Operators: Arithmetic, Relational, Logical and Assignment; Increment, Decrement and Conditional, Operator Precedence and Associations; Expressions. Expression evaluation and type conversion.Formatted input and output.
Statements: Assignment, Initialization, String handling with arrays, String handling functions, Functions – Arguments passing, Return values and their types, recursion. Enumerated data types.Structures.Arrays of structures.Arrays within structures.
Pointers: Declaration and initialization, Accessing variables through pointer arithmetic, Pointers and arrays, String, Pointer to Functions and Structures, Dynamic Storage Allocation.
File handlings: Opening, Closing, I/O operations.

Recommended Books:

1.C Programming,Karnighan,&Ritchie, PHI
2.Programming through C, Richard Johnsonbaugh and Martin Kalin, Pearson Education
3. Programming in C, B.S. Gottfried,Sahaum Series.
4. Programming in ANSI C, E. Balaguruswami,TMH.

Course Title: Programming in C Laboratory CREDITS: 2
Course Code: Core-II Practical **CONTACTS: 4P**

Programming should be developed using C Language to implement the problems related to courseCore-II.

B.Sc. (Honours) in Computer Science SecondSemester

Course Title: Operating System **CREDITS: 6**
Course Code: Core-III **CONTACTS: 5L+1T**

Operating system as an extended machine and a resource manager, operating system concepts- process, files, shell, Operating system structure: monolithic system, layered systems, virtual machines, client server model. Idea of multiprogramming, multiprocessing, batch processing and time sharing. Real time systems.
Concurrent processes: Critical section problem, Semaphores & Synchronization.
CPU scheduling: Scheduling concepts and algorithms. Memory management: Static & dynamic partitioning, Dynamic relocation, Paging & demand paging memory management, Virtual memory, Replacement algorithm, Segmented memory management, Thrashing. Device management: Scheduling concept and algorithm, spooling.**Deadlock:** Detection, prevention and avoidance.
File management: File concept, access methods, allocation methods, Directory concept.

Recommended Books:

1. Modern Operating Systems- A.S. Tanenbaum (PHI)
2. Operating System Concepts, A. Silberschatz, Peter B. Galvin, G. Gagne, 6th Edition, John Wiley Sons, Inc.

Course Title: Data Structure **CREDITS: 4**
Course Code: Core-IV **CONTACTS: 4L**

Definition: Concepts of Data Types, Elementary structures, Data types and their interpretation
Arrays: Types, Memory Representation, Address Translation, Functions of single and multi-dimensional arrays with examples.
Linked Structures: Singly and doubly linked list (non-circular and circular), List manipulation with pointers: Searching, Insertion and deletion of elements.
***Stacks and Queues*:** Definition. Representation. Uses and Applications, Infix, Prefix &Postfix notations, Infix to postfix: conversion and evaluation. Application of queues.
***Recursion*:** Divide and Conquer, Elimination of Recursion.
Trees: Definition, Quantitative Properties, Binary Tree, Tree traversals, Internal and external path lengths: Properties, Minimum and maximum path length of a binary tree, Importance.
***Binary Search Trees*:** Definition, Searching, Insertion, Deletion.
Searching: Linear and binary search, Performance and complexity.
Hashing : Concepts, Advantages and Disadvantages, Different types of hash functions, Collision and Collision Resolution Techniques – Open Addressing with probing, Linear Chaining, Coalesced Chaining, Application.
Sorting: Terminology, Performance Evaluation, Different Sorting Techniques (Bubble, Insertion, Selection, Quick sort, Merge Sort, Heap, Partition Exchange, Radix with iterative and recursive description). Complexity, Advantages and Disadvantages.

Recommended Books:

1. Data Structure using C, A.M. Tanenbaum, PHI.
2. Data Structure,Liptsuitz, S. Outline Series
3. Data Structure, Ellis Horowitz andSartazSahani, Galgotia

Course Title: Data StructureLaboratory CREDITS: 2
Course Code: Core-IV Practical CONTACTS: 4P

Programming should be developed using C Language to implement the problems related to courseCore-IV.

B.Sc. (Honours) in Computer Science ThirdSemester

Course Title: Computer Architecture & Organization CREDITS: 6
Course Code: Core-V CONTACTS: 5L+1T

Basic computer organization: Accumulator based CPU, disadvantages, Improvements, CPU registers (IR, PC, SP, MAR, MDR, AC), IAS computer, Von Neumann computer.
Instruction: Machine instruction, Assembly language instruction, micro instruction, Instruction Cycle, Instruction Format, 0, 1, 2, 3-address instruction, instruction types, instruction set completeness, Addressing modes, Numerical problems on Instruction format.
Stack organization: Implementation of Stack using Shift register, Application of stack in Organization.
Memory: Types of Memory (RAM, ROM, DRAM, SRAM, SAM), characteristic of memory, Memory organization: Linear, 2D, Memory expansion (Horizontal, vertical and mixed).
Associative memory: Design and application.
Virtual memory: Concept, Mapping (Direct, Associative and Direct –associative mapping), Replacement algorithm (FIFO, LRU, LFU).
Cache memory: Concept of locality of reference, cache memory organization, Hit & miss, Write back & Write through Cache, Mapping (Direct, Associative and Set associative mapping), Numerical problems on cache mapping.
Bus Organization: Bus structure, I/O interfacing, tri-state logic, Address decoding (Absolute & Partial), Memory mapped I/O & I/O mapped I/O, Data transfer (Programmed I/O, Interrupt initiated I/O, DMA), Bus contention and bus arbitration.
ALU Design: Functions of ALU, Bit sliced ALU, Implementation of Arithmetic operations (Fixed point data [Addition, subtraction, multiplication and division algorithm for signed number represented in signed magnitude and 2's complement], Floating point data [Addition, subtraction, multiplication and division algorithm for signed number], BCD arithmetic, Implementation of Logical operation.
CU Design: Hardwired and Micro-programmed CU design and their relative advantages & disadvantages, Horizontal and vertical microinstruction, parallelism in Microinstruction.

Recommended Books:

1. M. Morris Mano, Computer System Architecture, Pearson.
2. John Hayes, Computer Architecture and Organization, McGrawHill.
3. William Stallings, Computer Organization and Architecture: Designing for Performance, Prentice Hall.

Course Title: Formal Language CREDITS: 6
Course Code: Core-VI CONTACTS: 5L+1T

Introduction: Synchronous & Asynchronous Sequential Circuit, Storage Element, Melayand Moore Machines, Design Technique of State Machine.
Finite State Model: Synchronous Sequential Machine; State Successor in SequentialMachine; Capabilities and Limitations of FSM; State Equivalence and MachineMinimization.
Theory Of Automata: Definition of Automation; Description of Finite Automation;Transition System; Properties of Transition Function; NDFA, DFA, Conversion fromNDFA to DFA, Minimization Of States (Equivalence Partition);Conversion From Mooreto Mealy machine and Vice Versa.
Formal Languages: Basic Definition of Grammar and Languages; Examples; ChomskyClassification of Languages; Languages and their Relations; Operation on Languages;Language and Automata.

Regular Set And Regular Grammar: Regular Expression; Finite Automata and RegularExpression; Regular Grammars and Regular Languages; Pumping Lemma for RegularSets, Application of Pumping Lemma, Closure Properties of Regular Languages.
Context-Free Languages: Basics of CFL; Sentential Forms; Derivation Trees;Ambiguity in CFG; Simplification of CFG; CNF And GNF;
Pushdown Automata: Basic Definition; Language Acceptance by PDA; DeterministicPDA.
Turing Machine: Turing Machine Model; Representation of Turing Machine; LanguageAcceptability by TM; Design of TM; Nondeterministic TM; Universal TM; HaltingProblem of TM, Church Turing Thesis; Unsolvable Problems about TM,NPCompleteness, Polynomial Time Reduction; Some NP Completeness Problems.

Books:

1. K.L.P. Mishra and N. Chandrasekaran, Theory of Computer Science:Automata, Languages and Computation, PHI.
2. Lewis and Papadimitriou, Elements of the Theory of Computation, PHI.
3. John Hopcroft, Rajeev Motwani and Jeffrey Ullman, Introduction to Automata Theory, Languages, and Computation (third edition), Addison Wesley, 2007.

Course Title: Digital Logic CREDITS: 4
Course Code: Core-VII CONTACTS: 4L

Combinational logic: Adders (Half and Full adder, their differences, Implementationusing logic gates and universal gate), subtractor (Half and Full subtractor, theirdifferences, Implementation using logic gates and universal gate), Parallel Adder and itsdisadvantage, Carry Look Ahead Adder, BCD Adder, Code Converter, Comparator,Decoder: 2X4 & 3X8 Decoder, Decoder with Enable line, BCD to Decimal Decoder,Logic circuit implementation, Expansion, Demultiplexer, Conversion of Decoder &DEMUX, Encoder, Priority Encoder, Multiplexer: 4X1 & 2X1 MUX, Expansion, QuadMUX, Logic circuit implementation, MUX Functionally complete, ROM, PLA and itsadvantage over ROM, SSD, Multiplexed display, Key board Encoder.
Sequential circuit: Difference from Combinational logic, Latch: RS, D, JK, T, Latchconversion, Flip-flop: RS, D, JK, T, Master slave, Edge trigger, Sequential circuit fromState diagram, State Reduction, Design from state equation, FSM and its Design,Counter: Asynchronous (UP, DOWN, UP/DOWN), Synchronous (e.g. UP, DOWN,UP/DOWN, ODD,EVEN, PRIME, FIBONACCI), Register: SISO, SIPO, PISO, PIPO,Universal shift register.
A/D and D/A converter: D/A (Weighted register, R-2R Ladder), A/D (Counter,Successive approximation) converter, resolution, accuracy.
Logic Families: TTL, MOS, CMOS, Comparison, Propagation delay, Power dissipation,
Fan-In, Fan-Out, Noise margin, Open Collector type logic gates and its advantages

Recommended Books:

1. M. Morris Mao, Digital Logic and Computer Design, PHI.
2. Floyd, Digital Fundamentals, Pearson Education.

Course Title: Digital Logic LaboratoryCREDITS: 2
Course Code: Core-VII Practical CONTACTS: 4P

Combinational Circuits:
1) Implement Half Adder/Half Subtractor/Full Adder/Full Subtractor using Logic Gates. Realize a logic function usingbasic/universal gates in SOP and POS form. Study the functionalities of 7483 and design a BCD adder using 7483 orequivalent.

2) Design of two level AND – OR, NAND –NAND, NOR-NOR circuits to realize any truth table. Realize XOR in two leveland multilevel.
3) Design a 4 bit 2's complement adder – subtractor unit using 7483 or equivalent and XOR gates.
4) Design a circuit to convert BCD numbers to corresponding gray codes.
5) Design a 4:1 MUX using NAND gates. Study of 74153 and 74151. Design Full Adder/Subtractor using MUX.
6) Design a 2:4 decoder using NAND gates. Study of 74155 and 74138. Design Full Adder/Subtractor using decoders.
7) Design a parity generator/checker using basic gates.
8) Design magnitude comparator using basic/universal gates. Study of 7485.
9) Design a seven segment display unit.

Sequential Circuits:
1) Realize S-R, D, J-K and T flip-flop using basic gates. (Study the undefined state in S-R flip-flop).
2) Design a shift register (shift left and shift right) using flip-flops. (Study the functional characteristic of IC 74194 withemphasis on timing diagram).
3) Design Asynchronous and Synchronous counters. Study of IC 74193.
4) Study the functional characteristics of RAM IC chip. Study of open collector and tri-state output. Horizontal and verticalexpansion of RAM chips by cascading. Use 74189, 7489, 2114 or any available chip.

Skill Enhancement Course-I (Any One)

Course Title: Fundamentals of Information & Communication Technology CREDIT: 2
Course Code: SEC-I (i) CONTACTS: 2L

Unit-I : Introduction to information technology : Data, Information, Software/ Hardware, Computer component, Communication device and s/w and h/w tools.

Unit-II: Fundamentals of Internet : Networking Concepts, PAN,LAN, MAN, WAN, Internet., Internet applications: Introduction to Social Networking: twitter, Linkedin, facebook, instagram, skype, google+, youtube, WhatsApp, etc. E-mail:Definition of E-mail, Email Addresses, Domain Names, Message Components, Message Composition.

Unit-III: Basic HTML and web applications: Basic HTML – Web Terminology – Structure of a HTML Document – HTML, Heading, Font, Image and Anchor Tags –Different types of Lists using tags – Table Tags.

Unit IV: Communication model,data and signal,Shannon theorem,Signal to noise ratio,bid,baud.Modulation and Demodulation:FSK,ASK,PSK,QPSK.

Books:

1. Introduction to Computers (Seventh Edition) (Special Indian Edition) ,Peter Norton, TMH.
2. Foundations of Information Technology,D.S.Yadav, New Age International.
3. Data and Communication-W.Stallings,PHI.

Course Title: System Analysis & Design **CREDIT: 2**
Course Code: SEC-I (ii) **CONTACTS: 2L**

Unit I: System, System component, System Analysis, Business system concepts, System Development Life Cycle, Waterfall model (various phase).

Unit II: Planning: data gathering techniques, feasibility studies, cost benefit analysis
Design and Modeling: logical and physical design, flow charts, structured charts, DFD and ERD, form design, user interface design Modularity: module specification concepts, coupling and cohesion , System testing, Maintenance: evaluation, type of maintenance , validation, maintenance issues.

Unit III: Case study (online shopping/online admission/Library management)

Recommended Books:

1. Systems Analysis and Design, Kendall, Prentice Hall, 2013.
2. Systems Analysis and Design, Alan Dennis, Wiley Publishing.

B.Sc.(Honours) in Computer ScienceFourth Semester

Course Title: Software Engineering **CREDITS: 6**
Course Code:Core-VIII **CONTACTS: 5L + 1T**

Introduction: Software engineering discipline – evolution and impact, Program vs S/W, Emergence of S/W engineering (Introduction to Control based design, Data structure oriented design, data flow oriented design, object oriented design).
Software life cycle: Usefulness, Life cycle Model -Classical water fall model, Iterative waterfall model, prototype model, spiral model, comparative study of different models.
Software Requirement Specification: Role of system analyst, Need, Components and characteristic of SRS, Problems without a SRS, SRS document for Simple problems.
Software Matrices: Halstead matrix, volume, size, difficulty, Effort estimation.
Software design: Cohesion & Coupling, S/W design Approach - Function oriented approach (DFD, Structure chart, Transformation of DFD into Structure chart), Object oriented approach (UML diagram, Use case model, class diagram, Interaction diagram)
Coding: Coding standards, Code review - Code walk through, Code Inspection, Clean room testing.
Testing: Unit Testing (Driver and Stub Module, Black box testing [Equivalence class Partitioning and Boundary value analysis], White box testing [Statement coverage, Edge/branch coverage, condition coverage, path coverage, cyclomatic complexity]), Integration Testing (Big bang, Top down, Bottom up, Mixed approach), Verification and Validation of Software.
Maintenance: Characteristics, Types (corrective, adaptive and perfective), Software maintenance process model (Reverse engineering cycle followed by forward engineering model).
Software Cost and Time estimation: Functions points, Issues in software cost estimation, Introduction to the Rayleigh curve, Algorithmic cost models (COCOMO).

Recommended Books:

1. R.S. Pressman, Software Engineering: A Practitioner‘s Approach (7th Edition), McGraw-Hill, 2009.
2. Rajib Mall, Fundamentals of Software Engineering, PHI.
3. PankojJalote, Software Engineering: A Precise Approach, Wiley.

Course Title: Computer Networks **CREDITS: 6**
Course Code:Core-IX **CONTACTS:5L + 1T**

Introduction: Communication systems, Analogue data, digital data, Communication channels, Synchronous data, Asynchronous data. Concepts of LAN, MAN and WAN. Modes of data transfer (simplex, half duplex,ful duplex).
Multiplexing: FDM (Multiplexing and De-multiplexing Process, Applications), TDM (Time Slot and Frames, Interleaving, Bit Padding, Applications),WDM.
Transmission Media: Guided Media(Twisted Pair, Co-Axial Cable, Fiber Optics Cable); Unguided Media(Radio Waves, Microwaves, Infrared, Satellite Communication); NIC.
Switching: Circuit, Packet and Message Switching; Comparisons.
Modems: DSL, Cable Modems.
Network Software: OSI and TCP/IP Models, Functions of each layers.
Data Link Layer: Error Detection and Correction (Parity, Checksum, CRC, Humming Code); MAC Layer; Stop-And-Wait ARQ, Sliding Window Protocol, Selective Repeat ARQ, HDLC Protocol; ALOHA (Pure and Slotted), CSMA/CD Protocol, Polling; Token Passing; CDMA; Ethernet, Token Bus, Token Ring, ATM.

Network Layer: IP Addressing and Classes of IP Address; Subnet; Static and dynamic routing; ARP; IP; ICMP; unicast and multicast routing protocols;
Transport layer: process-to-process delivery; UDP; TCP; Congestion control protocols.
Connecting Devices: Repeaters, Hub, Bridges, Switch, Router and Gateway.
Application Layer: client server model; FTP, HTTP, SMTP, Telnet etc protocols.
Security: Firewall**,** Basics of cryptography; message security; digital signature.

Recommended Books:
1. B. A. Forouzan: Data Communications and Networking, Fourth edition, THM ,2007.
2.A. S. Tanenbaum: Computer Networks, Fourth edition, PHI , 2002
3.William Stallings:Data and Computer Communications,Eight Edition, Pearson.

Course Title: Database Management System CREDITS: 4
Course Code: Core-X CONTACTS: 4L

Introduction: Basic Concept, Drawbacks of File Management; Advantages of DBMS; Layered Architecture of Database, Data Independence; Data Models; Schemas and Instances; Database Languages; Database Users, DBA; Data Dictionary; Functional Components of a DBMS.
ER Model: Entity, Attributes and Relationship; Structural Constraints; Keys(candidate,super,foreign,primary); Weak & strong Entity Set;ER Diagram; Specialization and Generalization; Constraints of Specialization and Generalization; Aggregation.
Relational Model: Basic Concepts of Relational Model; Relational Algebra, introduction to Tuple Relational Calculus.
SQL: DDL,DCL,DML commands, aggregate functions, create a database table, create relationships between database tables, modify and manage tables, queries, create view.
Integrity Constraints: Domain Constraints, Referential Integrity.
Relational Database Design: Problems of Un-Normalized Database; Functional Dependencies, Derivation Rules, Closure of FD Set, Membership of a Dependency, Canonical Cover; Decomposition to 1NF, 2NF, 3NF or BCNF Using FDs; Lossless Join Decomposition & Dependency Preservation.
Transaction Processing: ACID properties, concurrency control

Recommended Books:
1.R. Elmasri, S.B. Navathe, Fundamentals of Database Systems 6th Edition, Pearson Education,2010.
2. R. Ramakrishanan, J. Gehrke, Database Management Systems 3rd Edition, McGraw-Hill,2002.
3. A. Silberschatz, H.F. Korth, S. Sudarshan, Database System Concepts 6th Edition, McGrawHill, 2010.
4. R. Elmasri, S.B. Navathe Database Systems Models, Languages, Design and applicationProgramming, 6th Edition, Pearson Education,2013.
5. Ullman, Principles of Database Systems, Galgotia Publications.

Course Title: DBMS Laboratory CREDITS: 2
Course Code: Core-X Practical CONTACTS: 4P

Related to Paper Core-X using SQL.
Creating Database
Creating a Database

Creating a Table
Specifying Relational Data Types
Specifying Constraints
Creating Indexes

Table and Record Handling

INSERT statement
Using SELECT and INSERT together
DELETE, UPDATE, TRUNCATE statements
DROP, ALTER statements

Retrieving Data from a Database

The SELECT statement
Using the WHERE clause
Using Logical Operators in the WHERE clause
Using IN, BETWEEN, LIKE , ORDER BY, GROUP BY and HAVING
Clause
Using Aggregate Functions
Combining Tables Using JOINS
Subqueries

Database Management

Creating Views
Creating Column Aliases
Creating Database Users
Using GRANT and REVOKE

Recommended Books:

1. Ivan Bayross:SQL,PL/SQL The Programming Language of Oracle, third edition**.**

Skill Enhancement Course-II (AnyOne)

Course Title: UNIX and Shell Programming Lab — CREDITS: 2
Course Code: SEC-II (i) — CONTACTS: 4P

External and internal commands of UNIX
What is shell and various type of shell, Various editors present in unix/linux
Different modes of operation in vi editor
What is shell script, Writing and executing the shell script
Shell variable (user defined and system variables)
System calls, Using system calls
Pipes and Filters
Decision making in Shell Scripts (If else, switch), Loops in shell
Functions
Utility programs (cut, paste, join, tr, uniq utilities)
Pattern matching utility (grep).

Recommended Books:

1. Sumitabha, Das, Unix Concepts and Applications, Tata McGraw-Hill Education.
2. Nemeth Synderand Hein, Linux Administration Handbook, Pearson Education, 2nd Edition ,2010.

3. W. Richard Stevens, Bill Fenner, Andrew M. Rudoff, Unix Network Programming, The sockets Networking API, Vol. 1, 3rd Edition,2014.
4. Yashavant Kanetkar , UNIX Shell Programming, BPB Publication.
5. Kernighan and Pike, The Unix Programming Environment, Prentice-Hall.

Course Title: Web TechnologyLab

CREDITS: 2

Course Code: SEC-II (ii)

CONTACTS: 4P

Basics: URL, Webpage, Homepage, http, www, text, hypertext, TCP/IP.

Introduction to Web Design: Introduction to hypertext markup language (html), document type definition, creating web pages, graphical elements, lists, hyperlinks, tables, web forms, inserting images, frames.

Customized Features: Cascading style sheets (css) for text formatting and other manipulations.

JavaScript: Data types, operators, functions, control structures, events and event handling.

Books:

1. Ivan Bayross, Web Enabled Commercial Application Development Using Html, Dhtml,javascript, Perl Cgi , BPB Publications, 2009.
2. J. Jaworski, Mastering Javascript, BPB Publications, 1999
3. T. A. Powell, Complete Reference HTML (Third Edition),TMH, 2002
4. Godbole A. S. &Kahate A, Web Technologies, TMH.
5. Xavier C., Web Technology & Design, New Age Publication.

B.Sc.(Honours) in Computer Science Fifth Semester

Course Title: Computer Graphics **CREDITS: 4**
Course Code: Core-XI **CONTACTS: 4L**

Computer Graphics Basics : Basic elements of Computer graphics, Cathode Ray Tube, Raster Scan, Application of Computer Graphics.Architecture of Raster and Random scan display devices, input/output devices.

Output Primitives: Points and Lines, Line Generation Algorithm(DDA Algorithm, Bresenham's Line Generation, Mid-Point Algorithm), Line Function, Circle-Generating Algorithms(Bresenham's Algorithm and Midpoint Circle Algorithm), Properties of Circles,Ellipse-Generating Algorithms, Midpoint Ellipse Algorithm, Properties of Ellipses. Filled-Area Primitives, Scan-Line Polygon Fill Algorithm Inside-Outside Tests, Scan-Line Fill of Curved Boundary, Areas Boundary-Fill Algorithm, Flood-Fill Algorithm, Fill-Area Functions.

Two-Dimensional Geometric Transformations: Basic Transformations Translation Rotation Scaling , Matrix Representations and Homogeneous Coordinates , Composite Transformations, General Pivot-Point Rotation ,General Fixed-Point Scaling, General Scaling Directions, Concatenation Properties, General Composite Transformations and Computational Efficiency ,Other Transformations – Reflection, Shear,Transformations Between Coordinate Systems.

Two-Dimensional Viewing : Viewing Coordinate Reference Frame, Window-to-viewport Coordinate Transformation, Clipping Operations, Point Clipping, Line Clipping(Cohen-Sutherland Line Clippings, Cyrus-Beck Line Clipping Algorithm), Polygon Clipping (Sutherland Hodgman Algorithm),Text Clipping,Curve Clipping, Exterior Clipping.

Three-Dimensional Geometric and Modeling Transformations: Translation,Rotation,Coordinate-Axes Rotations , General Three-Dimensional Rotations,Scaling,Reflections,Shears, Composite Transformations, Three-Dimensional Transformation Functions,Modeling and Coordinate Transformations.

Recommended Books:

1. D.Hearn, Baker: Computer Graphics, Prentice Hall of India 2008.
2. D.P.Mukherjee,Fundamentals of Computer Graphics and Multi Media, PHI.

Course Title: Computer Graphics Laboratory **CREDITS: 2**
Course Code: Core-XI Practical **CONTACTS: 4P**

Programming should be developed using C Language to implement the problems related to course Core-XI.

Course Title: Object oriented programming with C ++ **CREDITS: 4**
Course Code: Core-XII **CONTACTS: 4L**

Basics of OOP: Principles of Object-Oriented-Programming (OOP), comparison of proceduralprogramming and OOP, Advantages of OOP, Overview of OOP using C++, Polymorphism, Inheritance, Class, Function, Friend Function, Operators – Unary and Binary, Operator Overloading.

Classes and Objects: Declaration of classes and objects, Objects as function arguments, Arrays of objects, returning objects from function, structures and classes, Friend function.

Constructors and Destructors: Constructors, Basic constructors, parameterized constructors,

Constructors with default argument, dynamic initialization of objects, copy constructors, dynamic constructors, destructors, constraints on constructors and destructors.
Polymorphism-Function Overloading.
Operator Overloading: Overloading unary operators and binary operators using member functions and friend functions,multiple overloading, comparison operators, conversion between objects and basic types,conversion between objects of difference classes, constraints on type conversion.
Derived Classes and Inheritance: Derived classes and base classes, defining a derived class,accessing base class member, derived class constructors, overriding the member function, class hierarchies, Inheritance – public, protected and private access specifiers, access combinations and usage of access specifiers, different types of Inheritance.
Pointers: Pointers to objects, Virtual functions, Abstract classes.
Streams: Stream classes, stream class hierarchy, stream manipulators, string streams, character stream classes.
Templates: Function templates and class templates
Introduction to Exception handling.

Recommended Books:
1. Object Oriented Programming through C++,E.Balagurusamy, TMH.
2. Object Oriented Programming in Turbo C++,Lafore Robert, Galgotia Publications.

Course Title: C++ Laboratory CREDITS: 2
CODE: Core-XII Practical CONTACTS: 4P

Programming should be developed using C++ Language to implement the problems related to courseCore-XII.

Core Elective – DSE-I (Any One)

Course Title: Analysis of Algorithms CREDITS: 2
Course Code: DSE-I (i) CONTACTS: 5L + 1T

Introduction: Basic Design and Analysis techniques of Algorithms, Correctness of Algorithm.
Growth of Functions: Asymptotic notation, Big-O, Theta, Omega notations.
Algorithm Design Techniques: Iterative techniques, Divide and Conquer, Dynamic Programming, Greedy Algorithms.
Sorting and Searching Techniques: Elementary sorting techniques–Bubble Sort, Insertion Sort, Merge Sort, Advanced Sorting techniques - Heap Sort, Quick Sort, Sorting in Linear Time - Bucket Sort, Radix Sort and Count Sort, Searching Techniques, Medians & Order Statistics, complexity analysis;
Lower Bounding Techniques: Decision Trees
Balanced Trees:B+ Trees, Red-Black Trees
Advanced Analysis Technique: Amortized analysis
Graphs: Graph Algorithms–Breadth First Search, Depth First Search and its Applications.
Greedy algorithm: Characteristics and features of problem solving by greedy algorithm,basic structure, feasibility, Huffman code, Dijkstra, Spanning tree and minimumspanning tree(Kruskal and Prism algorithms).
String Processing: String Matching, KMP Technique

Recommended Books:
1. T.H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein Introduction to Algorithms, PHI, 3rd Edition 2009
2. Sarabasse& A.V. Gelder Computer Algorithm – Introduction to Design and Analysis, Publisher – Pearson 3rd Edition 1999

Course Title: Advance Database Management System **CREDITS: 6**
Course Code: DSE-I (ii) **CONTACTS: 5L+1T**

Database Design: Multivalued dependencies, theory of normalisation-4NF, 5NF, 6NF, DKNF.
Relational model conformity
Integrity Constraints: Assertions, Triggers.
Advanced SQL programming - Embedded SQL & Applications
SQL standards: SQL 1999, SQL 2003
Query optimization
Concurrency control and Transaction management: Recovery management. Transaction model properties, lock base protocols, Two-phase locking, Live – Lock, Time- Stamp Protocol
Database performance tuning
Distributed relational systems and Data Replication
Security considerations
Brief introduction to distributed database, temporal database and object-oriented database
New database applications and architectures: Data Warehousing andData Mining
Introduction Big data and its characteristics.

Recommended Books:

1. Silberschatz A., Korth H., and Sudarshan S., Database System Concepts, McGraw-Hill (6th Ed), 2010
2. Date C. J., An Introduction to Database Systems, AddisonWesley Longman (8th Ed), 2003
3. Thomas M. Connolly, Carolyn Begg, Database Systems: practical approach to design, implementation, and management, Pearson Education Limited, (6th edition), 2015.

Core Elective – DSE-II (Any One)

Course Title: Compiler Design **CREDITS: 6**
Course Code: DSE-II (i) **CONTACTS: 5L+1T**

Introduction: Introduction to Compilers, Analysis-synthesis model, The phases of the compiler, Cousins of the compiler. **Lexical Analysis:** The role of the lexical analyzer, Tokens, Patterns, Lexemes, Input buffering, Specifications of a token, Recognition of tokens, Finite automata, from a regular expression to an NFA, from a regular expression to DFA, Design of a lexical analyzer generator (Lex).
Syntax Analysis: The role of a parser, Context free grammars, Writing a grammar, Top down Parsing, Non-recursive Predictive parsing (LL), Bottom up parsing, Handles, Viable prefixes, Operator precedence parsing, LR parsers (SLR, LALR), Parser generators (YACC). Error Recovery strategies for different parsing techniques.
Syntax directed translation: Syntax directed definitions, Construction of syntax trees, Bottom-up evaluation of S attributed definitions, L attributed definitions, Bottom-up evaluation of inherited attributes.
Type checking: Type systems, Specification of a simple type checker, Equivalence of type expressions, Type conversions
Run time environments: Source language issues (Activation trees, Control stack, scope of declaration, Binding of names), Storage organization (Subdivision of run-time memory, Activation records), Storage allocation strategies, Parameter passing (call by value, call by reference, copy restore, call by name), Symbol tables, dynamic storage allocation techniques.
Intermediate code generation: Intermediate languages, Graphical representation, Three-address code, Implementation of three address statements (Quadruples, Triples, Indirect triples).

Code optimization: Introduction, Basic blocks & flow graphs, Transformation of basic blocks, Dag representation of basic blocks, The principle sources of optimization, Loops in flow graph, Peephole optimization. Code generations Issues in the design of code generator, a simple code generator, Register allocation & assignment.

Recommended Books:

1. Aho, Sethi, Ullman, Compiler Principles, Techniques and Tools, Pearson Education.
2. Holub, Compiler Design in C, PHI
3.Tremblay and Sorenson, Compiler Writing, McgrawHill International .
4. S Chattopadhyay , Compiler Design, PHI.

Course Title: Artificial Intelligence CREDITS: 6
Course Code: DSE-II (ii) CONTACTS:5L+1T

Introduction: Overview of Artificial intelligence- Problems of AI, AI technique, Tic - Tac - Toe problem.
Intelligent Agents: Agents & environment, nature of environment, structure of agents, goal based agents, utility based agents, learning agents.
Problem Solving: Problems, Problem Space & search: Defining the problem as state space search, production system, problem characteristics, issues in the design of search programs.
Search techniques: Solving problems by searching:problem solving agents, searching for solutions; uniform search strategies: breadth first search, depth first search, depth limited search, bidirectional search, comparing uniform search strategies.
Heuristic search strategies: Greedy best-first search, A* search, memory bounded heuristic search: local search algorithms & optimization problems: Hill climbing search, simulated annealing search, local beam search, genetic algorithms; constraint satisfaction problems, local search for constraint satisfaction problems.
Adversarial search: Games, optimal decisions & strategies in games, the minimax search procedure, alpha-beta pruning, additional refinements, iterative deepening.
Knowledge & reasoning: Knowledge representation issues, representation & mapping, approaches to knowledge representation, issues in knowledge representation.
Using predicate logic: Representing simple fact in logic, representing instant & ISA relationship, computable functions & predicates, resolution, natural deduction.
Representing knowledge using rules: Procedural verses declarative knowledge, logic programming, forward verses backward reasoning, matching, control knowledge.
Probabilistic reasoning: Representing knowledge in an uncertain domain, the semantics of Bayesian networks, Dempster-Shafer theory, Fuzzy sets & fuzzy logics.
Planning: Overview, components of a planning system, Goal stack planning, Hierarchical planning, other planning techniques.
Natural Language processing: Introduction, Syntactic processing, semantic analysis, discourse & pragmatic processing.
Learning: Forms of learning, inductive learning, learning decision trees, explanation based learning, learning using relevance information, neural net learning & genetic learning.
Expert Systems: Representing and using domain knowledge, expert system shells, knowledge acquisition. Basic knowledge of programming language like Prolog & Lisp.

Recommended Books:

1. Artificial Intelligence: A Modern Approach, Stuart Russel Peter Norvig, Pearson Education.
2. Introduction to Artificial Intelligence & Expert Systems, Patterson, PHI.
3. Logic & Prolog Programming, SarojKaushik, New Age International.

B.Sc.(Honours)in Computer Science Sixth Semester

Course Title: Core Java **CREDITS: 4**
Course Code: Core-XIII **CONTACTS: 4L**

Introduction: JAVA as internet language. A first simple program. Entering the program, Compiling the program, control statements, using blocks of code, lexical issues-white space, identifiers, literals, comments, separators, The Java keyword- The java class libraries, data types, variables and arrays, the simple types, integers-byte, short, int, long, floating point types-float, double, characters, Booleans. A closer look at literals-integer literals, floating point literals, Boolean literals,character literals, string literals, variables – declaring a variable, dynamic initialization, the scope and lifetime of variables, type conversion and casting – java's automatics conversions, casting incompatible types, automatic type promotion in expressions, the type promotion rules, arrays-one dimensional arrays, multidimensional arrays, alternative array declaration syntax. Operators-assignment operators, increment and decrement, the bitwise operators, relational operators, Boolean logical operators, the assignment operator, the ? operator, operator precedence, using parentheses, control statements-Java's selection statements, if, switch, interaction statements-while, do-while, for, some for loop variations, nested loops, jump statements-using break, using continue, return.
Introduction Classes: class fundamentals, the general form of a class, a simple class, declaring objects, a closer look at new, assigning object reference variables, introducing methods, adding a method, the box class, returning a value, adding a method to the box class, constructors, parameterized constructors, the this keyword, instance variable hiding, garbagecollection, the finalize method, a stack class, a closer look at methods and classes, overloading methods, overloading constructors. Using object as parameters, argument passing, returning objects, introducing access control, understanding static, introducing final, arrays revised., exploring the string class, using command line arguments, inheritance, inheritance basics, a more practical example, a superclass variable can reference a subclass object, using super, using super to call superclass constructors, a second use for super, creating a multilevel hierarchy, when constructor are called, method overriding, dynamic method dispatch, overridden methods, applying methods overriding, using abstract classes, using final with inheritance, using final to prevent overriding, using final to prevent inheritance, the object class.
Package and interfaces: Defining a package, understanding class path, a short package example, access protection, an access example, importing packages- interface-defining an interface, implementing interfaces, applying interfaces, variables in interfaces, interface can be extended.
Exception Handling: Exception fundamentals, exception types, uncaught exceptions, using try and catch, displaying a description of an exception, multiple catch clauses, nested try statements, throw, throws, finally, java's built-in exceptions-creating you own exception subclasses, using exceptions, multithreaded programming.
Threads: The java's thread model, thread priorities, synchronization, message, the thread class and the runnable interface, the main thread, creating a thread, implementing runnable, extending thread, closing an approach, creating multiple thread, thread priorities, synchronization, using synchronized methods, the synchronized statement, inter-thread communication, using multithreading.
Stream classes: The predefined streams, reading console input, writing console output, reading and writing files, the transient and volatile modifiers, using instance of native methods, problem with native methods.
String handling: The string constructor, string length, special string operations-string literals, string concatenation, string concatenation with other data types, string conversion, character extraction, string comparison, searching strings, modifying a string-data conversion using string buffer constructors.
Wrappers: Number, double and float, integer and long, character, Boolean, process, runtime, memory management, executing other programs, system-using current time limits to time, program execution, using array copy, environment properties, object, using clone and the cloneable interface, class, class loader, math-transcendental functions, exponential functions, rounding functions, miscellaneous math methods, classes, input stream, output stream file input stream, file output stream.

Java Database Connectivity (JDBC): Implementation of simple system using JDBC.

Recommended Books:

1. E. Balaguruswamy, Programming with Java, 4th Edition, McGraw Hill.2009.
2. John R. Hubbard,"Programming with JAVA, Schaum's Series, 2nd Edition, 2004.
3. Herbert Schildt, The Complete Reference Java 2, TMH.

Course Title: Java Laboratory — CREDITS: 2
Course Code: Core-XIII Practical — CONTACTS: 4P

Programming should be developed using Core Java to implement the problems related to course Core-XIII.

Course Title: Microprocessor — CREDITS: 4
Course Code: Core-XIV — CONTACTS: 4L

Microprocessor architecture: Internal architecture (Pin Configuration), system bus architecture, memory and I/O interface.
Microprocessor programming: General and special purpose registers (AC, PC, SP, MAR, DAR, Flag, B-C, D-E, H-L pairs, PSW), Register Organization, Instruction Set, Instruction Formats, Addressing Modes, Instruction Cycle, Clock Cycles, Timing Diagrams, assembly language programming.
Interrupt: Hardware and Software Interrupt – RSTs, Vector Call, TRAP and INTR etc.
Interfacing: Memory address decoding, cache memory and cache controllers, I/O interface, keyboard, display, timer, Interrupt Handling, Methods of Interrupts,Interrupt Controller, DMA Controller, Video Controllers, communication interfaces.
Case Studies: 8085 and 8086 microprocessor.

Recommended Books:

1.RameshGankar, “Microprocessor Architecture, Programming, and Applications with the 8085”, PIP (India)
2. Barry B. Brey : The Intel Microprocessors : Architecture, Programming and Interfacing. Pearson Education, Sixth Edition,2009.
3. Walter A Triebel, Avtar Singh; The 8088 and 8086 Microprocessors Programming, Interfacing, Software, Hardware, and Applications. PHI, Fourth Edition 2005.

CODE: Core XIV Practical — CONTACTS: 4P
Microprocessor Laboratory — CREDITS: 2

Programming should be developed using 8085 assembly language to implement the problems related to courseCore-XIV.

Sample Programs:

ASSEMBLY LANGUAGE PROGRAMMING
1. Write a program for 32-bit binary division and multiplication
2. Write a program for 32-bit BCD addition and subtraction
3. Write a program for Linear search and binary search.
4. Write a program to add and subtract two arrays
5. Write a program for binary to ascii conversion
6. Write a program for ascii to binary conversion

Core Elective (Any One)

Course Title: Optimization Techniques **CREDITS: 6**

Course Code:DSE-III (i) **CONTACTS: 5L+1T**

Introduction to Operational Research (OR): Origin & Development, Different Phases of OR study, Methodology of OR, Scope and Limitations of OR, Applications of OR.

Linear Programming: Linearly independent / dependent vectors, Basis, Convex sets, Extreme points. Graphical method. Simplex method, Artificial variable techniques- Two Phase Method; M-Charnes Method, Special cases in LPP.

Duality: Definition of the dual problem, Primal-dual relationships, Economic Interpretation of Duality, Dual simplex Method.

Transportation and assignment problems: Transportation type problem in standard L.P. form,Special features of transportation type problem, North-West Corner method,Matrix Minima method,Vogel's Approximation method, Mathematical formulation and solution of the assignment problem.

PERT/ CPM.:Introduction, Phases of project scheduling, WorkBreakdown structure,Network (Arrow Diagram), Numbering of Events (Fulkerson's Rule), Critical Part Method, Programme Evaluation and Review Technique (PERT), Cost Analysis and Crashing the Network, Project Cost, How the Networks (PERT/CPM) help Management?, Difficulties of Using Network Methods, Applications of Network Techniques.

Recommended Books:

1. G. Hadley: Linear Programming. Narosa, 2002 (reprint).
2. A. Ravindran, D. T. Phillips and James J. Solberg: Operations Research-Principles and Practice, John Wiley & Sons, 2005.
3. Hamdy A. Taha: Operations Research-An Introduction, Prentice Hall, 8th Edition, 2008.
4. F.S. Hillier. G.J. Lieberman: Introduction to Operations Research- Concepts and Cases, 9th Edition, Tata McGraw Hill. 2010.
5. Gupta and Hira, Introduction to Operations research, S. Chand & Company Ltd.
6. Chakravorty and Ghosh, Linear Programming, Moulik Library.

Course Title: Advanced Computer Architecture **CREDITS: 6**

CODE: DSE-III (ii) **CONTACTS: 5L+1T**

Fundamentals Of Computer Design: Introduction; Classes of computers; Defining computer architecture; Trends in Technology, power in Integrated Circuits and cost; Dependability; Measuring, reporting and summarizing Performance; Quantitative Principles of computer design.

Pipelining: Introduction; Pipeline hazards; Implementation of pipeline; What makes pipelining hard to implement?

Instruction –Level Parallelism – 1: Concepts and challenges; Basic Compiler Techniques for exposing ILP; Reducing Branch costs with prediction; Overcoming Data hazards with Dynamic scheduling; Hardware-based speculation.

Instruction –Level Parallelism – 2: Exploiting ILP using multiple issue and static scheduling; Exploiting ILP using dynamic scheduling, multiple issue and speculation; Advanced Techniques for instruction delivery and Speculation; The Intel Pentium 4 as example.

Multiprocessors and Thread –Level Parallelism: Introduction; Symmetric shared-memory architectures; Performance of symmetric shared–memory multiprocessors; Distributed shared memory and directory-based coherence; Basics of synchronization; Models of Memory Consistency

Review of Memory Hierarchy: Introduction; Cache performance; Cache Optimizations, Virtual memory
Memory Hierarchy design: Introduction; Advanced optimizations of Cache performance; Memory technology and optimizations; Protection: Virtual memory and virtual machines.
Hardware and Software for VLIW and EPIC: Introduction: Exploiting Instruction-Level Parallelism Statically; Detecting and Enhancing Loop-Level Parallelism; Scheduling and Structuring Code for Parallelism; Hardware Support for Exposing Parallelism: Predicated Instructions; Hardware Support for Compiler Speculation; The Intel IA-64 Architecture and Itanium Processor; Conclusions.

Recommended Books:

1. Rajib Chopra, Advanced Computer Architecture, S Chand and Company Ltd.
2. Kai, Hwang and Naresh Jotwani, Advance Computer Architect: Parallelism, Scalability, Programmability, McGraw Hill Education.

Course Title: Animation & Multimedia CREDITS: 6
Course Code: DSE-III (iii) CONTACTS: 5L+1T

Multimedia: Introduction to multimedia, components, uses of multimedia, multimedia applications, virtual reality.
Text: Fonts & Faces, Using Text in Multimedia, Font Editing & Design Tools, Hypermedia & Hypertext.
Images: Still Images – bitmaps, vector drawing, 3D drawing & rendering, natural light & colors, computerized colors, color palettes, image file formats.
Sound: Digital Audio, MIDI Audio, MIDI vs Digital Audio, Audio File Formats.
Video: How video works, analog video, digital video, video file formats, video shooting and editing.
Animation: Principle of animations, animation techniques, animation file formats.
Internet and Multimedia: www and HTML, multimedia on the web – web servers, web browsers, web page makers and site builders.
Making Multimedia: Stages of a multimedia project, Requirements to make good multimedia, Multimedia Hardware - Macintosh and Windows production Platforms, Hardware peripherals - Connections, Memory and storage devices, Multimedia, software and Authoring tools.

Recommended Books:

1. Tay Vaughan, Multimedia: Making it work‖, TMH, Eighth edition, 2011.
2. Ralf Steinmetz and KlaraNaharstedt, Multimedia: Computing, Communications Applications‖, Pearson, 2012.
3. Keyes, Multimedia Handbook‖, TMH, 2000.
4. K. Andleigh and K. Thakkar, Multimedia System Design‖, PHI.2013.

Core Elective (Any One)

Course Title: Cryptographyand Network Security CREDITS: 6
Course Code: DSE–IV (i) CONTACTS: 5L+1T

Attacks on Computers & Computer Security: Introduction, Need for Security, Security approaches, Principles of Security, Types of attack.
Cryptography Concepts & Techniques: Introduction, Plaintext & Cipher text, Substitution Techniques, Transposition Techniques, Encryption & Decryption, Symmetric & Asymmetric key Cryptography, Key Range & Key Size

Symmetric Key Algorithm: Introduction, Algorithm types & Modes, Overview of Symmetric Key Cryptography, DES(Data Encryption Standard) algorithm, IDEA(International Data Encryption Algorithm) algorithm, RC5(Rivest Cipher 5) algorithm.
Asymmetric Key Algorithm, Digital Signature and RSA: Introduction, Overview of Asymmetric key Cryptography, RSA algorithm, NP-hard, Symmetric & Asymmetric key Cryptography together, Digital Signature, Basic concepts of Message Digest and Hash Function (Algorithms on Message Digest and Hash function not required). **Internet Security Protocols, User Authentication**: Basic Concepts, SSL protocol, Authentication Basics, Password, Authentication Token, Certificate based Authentication, Biometric Authentication.
Electronic Mail Security: Basics of mail security, Pretty Good Privacy, S/MIME.
Firewall: Introduction, Types of firewall, Firewall Configurations, DMZ Network

Recommended Books:

1. Cryptography and Network Security, William Stallings, 2nd Edition, Pearson Education Asia
2. Network Security private communication in a public world, C. Kaufman, R. Perlman and M. Speciner, Pearson
3. Cryptography & Network Security: AtulKahate, TMH.
4. Network Security Essentials: Applications and Standards, William Stallings, Pearson
5. Designing Network Security, MerikeKaeo, 2nd Edition, Pearson Books
6. Building Internet Firewalls, Elizabeth D. Zwicky, Simon Cooper, D. Brent Chapman, 2nd Edition, Oreilly
7. Practical Unix & Internet Security, SimsonGarfinkel, Gene Spafford, Alan Schwartz, 3rd Edition, Oreilly

Course Title: Mobile Ad-hoc Netwok CREDITS: 6
Course Code: DSE-IV (ii) CONTACTS: 5L+1T

Introduction to Ad-hoc networks: Definition, usefulness, characteristics features, applications, characteristics of Wireless channel, Ad-hoc Mobility Models- Indoor and outdoor, difference between wired network and Ad-hoc network, IP address, different classes of IP address, Software Define Network (SDN).
MAC Protocols: classification. Contention based protocols- withreservation, scheduling algorithms, protocols using directional antennas. IEEEstandards: 802.11a, 802.11b, 802.11g, 802.15. HIPERLAN.
Routing Protocols: classification. Proactive vs reactive routing,Unicast routing algorithms, Multicast routing algorithms, hybrid routing algorithm, Energyaware routing algorithm, Hierarchical Routing, QoS aware routing.
Transport layer: Transport layer classification, adhoc transportprotocols. Security issues in adhoc networks: issues and challenges, network securityattacks, secure routing protocols.
Cross layer Design: Need for cross layer design, cross layer optimization, parameteroptimization techniques, Cross layer cautionary prespective. Intergration of adhoc withMobile IP networks.

Recommended Books:

1. C.Siva Ram Murthy and B.S.Manoj, Ad hoc Wireless Networks Architectures and protocols, 2nd edition, Pearson Education, 2007.
2. Charles E. Perkins, Ad hoc Networking, Addison – Wesley, 2000.
3. William Stallings,Data and Computer communication, 6th Edition, Pearson Education.
4. Tanenbaum, Computer Networks, Pearson Education.

Course Title: Soft Computing **CREDITS: 6**
Course Code:DSE–IV (iii) **CONTACTS: 5L+1T**

Introduction: Introduction to soft computing; introduction to fuzzy sets and fuzzy logic systems; introduction to biological and artificial neural network; introduction to Genetic Algorithm.
Fuzzy sets and Fuzzy logic systems: Classical Sets and Fuzzy Sets and Fuzzy relations : Operations on Classical sets, properties of classical sets, Fuzzy set operations, properties of fuzzy sets, cardinality, operations, and properties of fuzzy relations. Membership functions : Features of membership functions, standard forms and boundaries, different fuzzification methods. Fuzzy to Crisp conversions: Lambda Cuts for fuzzy sets, fuzzy Relations, Defuzzification methods. Classical Logic and Fuzzy Logic: Classical predicate logic, Fuzzy Logic, Approximate reasoning and Fuzzy Implication Fuzzy Rule based Systems: Linguistic Hedges, Fuzzy Rule based system – Aggregation of fuzzy Rules, Fuzzy Inference System, Mamdani Fuzzy Models – Sugeno Fuzzy Models.
Applications of Fuzzy Logic: How Fuzzy Logic is applied in Home Appliances, General Fuzzy Logic controllers, Basic Medical Diagnostic systems and Weather forecasting
Introduction to Neural Networks: Advent of Modern Neuroscience, Classical AI and Neural Networks, Biological Neurons and Artificial neural network; model of artificial neuron.
Neural Network models: Perceptron, single layer network; Back-propagation and multi layer networks.
Competitive learning networks: Kohonen self organizing networks, Hopfield Networks.
Applications of Neural Networks: Pattern Recognition and classification
Genetic Algorithms: Simple GA, crossover and mutation, Multi-objective Genetic Algorithm (MOGA).
Applications of Genetic Algorithm: genetic algorithms in search and optimization, GA based clustering Algorithm, Image processing and pattern Recognition.
Other Soft Computing techniques: Basic concept of Simulated Annealing and Particle Swarm Optimization (PSO).

Recommended Books:
1. S. Rajasekaran and G.A.V.Pai, “Neural Networks, Fuzzy Logic and Genetic Algorithms”, PHI
2. Principles of Soft Computing , S N Sivanandam, S. Sumathi, John Wiley & Sons
3. Genetic Algorithms in search, Optimization & Machine Learning by David E. Goldberg
4. Neural Networks: A Classroom Approach,1/e by Kumar Satish, TMH,
5. A beginners approach to Soft Computing, Samir Roy &UditChakraborty, Pearson.
6. Fuzzy Sets and Fuzzy Logic: Theory and Applications, George J. Klir and Bo Yuan, Prentice Hall
7. Neural Networks: A Comprehensive Foundation (2nd Edition), Simon Haykin, Prentice Hall.

Kazi Nazrul University

Curriculum
for
B.Sc. (Program) with Computer Science

[Six Semesters Choice Based Credit System]

(With effect from 2016-2017 academic session)

Semester-I

Course Title: Computer Fundamentals and Programming in C

CONTACTS: 4L
CREDIT: 4 Full Marks: 50 (Internal Assessment: 10, Final Exam: 40)

Computer Fundamental:

Hardware: CPU, Primary and Secondary storage, I/O devices, Bus structure

Software: Systems and Application.

Generation of Computers: Super, Mainframe, Mini and Personal Computer.

Introduction to Programming Languages: Machine Language, Assembly Language, High Level Language.

Number representation: Weighted Codes, Non-weighted codes, Positional, Binary, Octal, Hexadecimal, Binary Coded Decimal (BCD), Conversion of bases. Complement notions. Binary Arithmetic, Binary Codes: Gray, Alphanumeric, ASCII, EBCDIC;

Fundamentals of Boolean algebra, Switches and Inverters, Functionally Complete Gates (AND, OR, NOT), NAND, NOR, Switching function and Boolean Function. De Morgan's Theorem.

Programming in C:

Introduction: Basic Structure, Character sets, Keywords, Identifiers, Constants, Variables, Data Types, Program Structure.

Operators: Arithmetic, Relational, Logical and Assignment; Increment, Decrement and Conditional, Operator Precedence and Associations; Expressions. Expression evaluation and type conversion.Formatted input and output.

Statements: Assignment, Initialization, String handling with arrays, String handling functions, Functions – Arguments passing, Return values and their types, recursion. Enumerated data types.Structures.Arrays of structures.Arrays within structures.

Pointers: Declaration and initialization, Accessing variables through pointer arithmetic, Pointers and arrays, String, Pointer to Structures, Dynamic Storage Allocation.

Text Book:

1. Digital Logic and Computer Design by M.Morris Mano, PHI
2. Modern Digital Electronics : R.P. Jain
3. Programming in C-B.S. Gottfried (Sahaum Series)
4. Programming in ANSI C- E. Balaguruswami (TMH)

Course Title: Programming in C Lab

CONTACTS: 4P
CREDIT: 2 Full Marks: 50 (Internal Assessment: 30, Final Exam: 20)

Programming should be developed using C Language to implement the problems related to theoretical Paper.

Semester-II

Course Title: Data Structure

CONTACTS: 4L
CREDIT: 4 **Full Marks: 50 (Internal Assessment: 10, Final Exam: 40)**

Concepts of data types, Elementary Structure, Words and their interpretation; Arrays: Types, Memory representation, Address translation, Functions of single and multi dimensional arrays with examples; Linked Structures: Singly linked list; List Manipulation with Pointers: Examples involving insertion and deletion of elements; Stack and Queues: Definition, Representation, Uses and applications-Recursion, Applications of queues;

Trees: Definition, Quantitative Properties, Binary Tree, Tree traversals, Internal and external path lengths: Properties, Minimum and maximum path length of a binary tree, Importance.

Searching: Linear and binary search

Searching: Linear and binary search; Sorting: Terminology, Performance evaluation, Different sorting techniques (Bubble, Insertion, Selection, Heap)

Text Book:

1. Data Structure using C- A.M. Tanenbaum (PHI)
2. Data Structure by Liptsuitz, S. Outline Series
3. Data Structure by Ellis Horowitz, SartazSahani, Galgotia

Course Title: Data Structure Lab

CONTACTS: 4P
CREDIT: 2 **Full Marks: 50 (Internal Assessment: 30, Final Exam: 20)**

Programming should be developed using C Language to implement different data structure problems.

Semester-III

Course Title: Operating System

CONTACTS: 5L+1T
CREDIT: 6 **Full Marks: 50 (Internal Assessment: 10, Final Exam: 40)**

Operating system as an extended machine and a resource manager, operating system concepts-process, files, shell, Operating system structure: monolithic system, layered systems, virtual machines,client server model. Idea of multiprogramming, multiprocessing, batch processing and time sharing. Realtime systems .Concurrent processes: Critical section problem, Semaphores &Synchronization.CPU scheduling: Scheduling concepts and algorithms. Memory management: Static &dynamicpartitioning, Dynamic relocation, Paging & demand paging memory management, Virtual memory,Replacement algorithm, Segmented memory management, Thrashing. Device management: Schedulingconcept and algorithm, spooling.Deadlock detection, prevention and avoidance.File management: File concept, access methods, allocation methods, Directory concept.

Text Book:

1. Modern Operating Systems- A.S. Tanenbaum (PHI)
2. Operating System Concepts, A. Silberschatz, Peter B. Galvin, G. Gagne, 6th Edition, John Wiley Sons, Inc.

Course Title: Unix & Shell Programming Lab
Course Code: SEC-1

CONTACTS: 4P
CREDIT: 2 **Full Marks: 50 (Internal Assessment: 30, Final Exam: 20)**

Overview of the UNIX Operating System General Purpose Utilities. Types of Shell (Bourne Shell,Cshell,Korn Shell),File system & Handling ordinary Files. Essential UNIX commands &vi editor. Shell programming writing.

Text Book:

1. UNIX Shell Programmig,YashavantKanetkar. BPB Publication.
2. Sumitabha, Das, Unix Concepts and Applications, Tata McGraw-Hill Education.

Semester-IV

Course Title: Database Management System

CONTACTS: 4L
CREDIT: 4 Full Marks: 50 (Internal Assessment: 10, Final Exam: 40)

Introduction: Basic Concept, Drawbacks of File Management; Advantages of DBMS; Layered Architecture of Database, Data Independence; Data Models; Schemas and Instances; Database Languages; Database Users, DBA; Data Dictionary; Functional Components of a DBMS.
ER Model: Entity, Attributes and Relationship; Structural Constraints; Keys (candidate, super, foreign, primary); Weak & strong Entity Set;ER Diagram; Specialization and Generalization; Constraints of Specialization and Generalization; Aggregation.
Relational Model: Basic Concepts of Relational Model; Relational Algebra.
SQL: DDL,DCL, DML commands, aggregate functions, create a database table, create relationships between database tables, modify and manage tables, queries.
Integrity Constraints: Domain Constraints, Referential Integrity.
Relational Database Design: Problems of Un-Normalized Database; Functional Dependencies, Derivation Rules, Closure of FD Set, Membership of a Dependency, Canonical Cover; Decomposition to 1NF, 2NF, 3NF or BCNF Using FDs; Lossless Join Decomposition & Dependency Preservation.

Text Book:

1.R. Elmasri, S.B. Navathe, Fundamentals of Database Systems 6th Edition, Pearson Education,2010.
2. A. Silberschatz, H.F. Korth, S. Sudarshan, Database System Concepts 6th Edition, McGraw Hill, 2010.
3. R. Elmasri, S.B. Navathe Database Systems Models, Languages, Design and applicationProgramming, 6th Edition, Pearson Education, 2013.

Course Title: DBMS Lab

CONTACTS: 4P
CREDIT: 2 Full Marks: 50 (Internal Assessment: 30, Final Exam: 20)

Related to Core course DBMS using SQL.

Text Book:

1. Ivan Bayross: SQL, PL/SQL The Programming Language Of Oracle, third edition**.**

Course Title: Web Technology Lab
Course Code: SEC-2

CONTACTS: 4P
CREDIT: 2 Full Marks: 50 (Internal Assessment: 30, Final Exam: 20)

Introduction to Web Design: Introduction to hypertext markup language (html), document type definition, creating web pages, graphical elements, lists, hyperlinks, tables, web forms, inserting images, frames, animation.
Customized Features: Cascading style sheets (css) for text formatting and other manipulations.
JavaScript: Data types, operators, functions, control structures, events and event handling.

Text Book:

1. J. Jaworski, Mastering Javascript, BPB Publications, 1999.
2. Ivan Bayross, Web Enabled Commercial Application Development Using Html, Dhtml,javascript, Perl Cgi , BPB Publications, 2009.
3. T. A. Powell, Complete Reference HTML (Third Edition),TMH, 2002.

Semester-V

Skill enhancement Course (Any One)

Course Title: Fundamentals of Information & Communication Technology CREDIT: 2 Full Marks: 50 (Internal Assessment: 10, Final Exam: 40)
Course Code: SEC-3 (i) CONTACTS: 2L

Unit-I : Introduction to information technology : Data, Information, Software/ Hardware, Computer component, Communication device and s/w and h/w tools.

Unit-II: Fundamentals of Internet : Networking Concepts, PAN,LAN, MAN, WAN, Internet., Internet applications: Introduction to Social Networking: twitter, Linkedin, facebook, instagram, skype, google+, youtube, WhatsApp, etc. E-mail :Definition of E-mail , Email Addresses, Domain Names, Message Components, Message Composition.

Unit III: Communication model, data and signal,Shannontheorem,Signal to noise ratio,bid,baud.Modulation and Demodulation:FSK,ASK,PSK,QPSK.

Text Book:

1. Introduction to Computers (Seventh Edition) (Special Indian Edition) ,Peter Norton, TMH.
2. Foundations of Information Technology,D.S.Yadav, New Age International.
3. Data and Communication-W.Stallings,PHI.

Course Title: System Analysis & Design
CREDIT: 2 Full Marks: 50 (Internal Assessment: 10, Final Exam: 40)
Course Code: SEC-3 (ii) CONTACTS: 2L

Unit I: System, System component, System Analysis, Business system concepts, System Development Life Cycle, Waterfall model (various phase).

Unit II: Planning: data gathering techniques, feasibility studies, cost benefit analysis
Design and Modeling: logical and physical design, flow charts, structured charts, DFD and ERD, form design, user interface design Modularity: module specification concepts, coupling and cohesion , System testing, Maintenance: evaluation, type of maintenance , validation, maintenance issues.

Unit III: Case study (online shopping/online admission/Library management)

Text Book:

1. Systems Analysis and Design, Kendall, Prentice Hall, 2013.
2. Systems Analysis and Design, Alan Dennis, Wiley Publishing.

Discipline Specific Electives-I(Any One)
Course Title: Object Oriented Programming with C++
CREDIT: 4 **Full Marks: 50 (Internal Assessment: 10, Final Exam: 40)**
Course Code: DSE-I(i) **CONTACTS: 4L**

Introduction: Principles of Object-Oriented-Programming (OOP), comparison of proceduralprogramming and OOP, Advantages of OOP, Overview of OOP using C++.
Classes and Objects: Declaration of classes and objects, Objects as function arguments, Arrays of objects, returning objects from function, structures and classes, Friend function.
Constructors and Destructors: Constructors, Basic constructors, parameterized constructors, Constructors with default argument, dynamic initialization of objects, copy constructors, dynamic constructors, destructors, constraints on constructors and destructors.
Polymorphism-Function Overloading.
Operator Overloading: Overloading unary operators and binary operators using member functions and friend functions,multiple overloading, comparison operators, conversion between objects and basic types,conversion between objects of difference classes, constraints on type conversion.
Derived Classes and Inheritance: Derived classes and base classes, defining a derived class,accessing base class member, derived class constructors, overriding the member function, class hierarchies, Inheritance – public, protected and private access specifiers, access combinations and usage of access specifiers, Different types of Inheritance.
Pointers: Pointers to objects, Virtual functions, Abstract classes.
Streams: Stream classes, stream class hierarchy, stream manipulators, string streams, character stream classes.

Text Book:
1. Object Oriented Programming through C++,E.Balagurusamy, TMH.
2. Object Oriented Programming in Turbo C++,Lafore Robert, Galgotia Publications.

Course Title: Programming in C++Lab
CREDIT: 2 **Full Marks: 50 (Internal Assessment: 10, Final Exam: 40)**
Course Code: DSE-I(i) Lab **CONTACTS: 4P**

Programming should be developed using CPP Language to implement the problems related to theoretical Paper.

Course Title: Computer Graphics
CREDIT: 4 **Full Marks: 50 (Internal Assessment: 10, Final Exam: 40)**
Course Code: DSE-I(ii) **CONTACTS: 4L**

Computer Graphics Basics: Basic elements of Computer graphics, Cathode Ray Tube, Raster Scan, Application of Computer Graphics.Architecture of Raster and Random scan display devices, input/output devices.

Output Primitives: Points and Lines, Line Generation Algorithm(DDA Algorithm, Bresenham's Line Generation, Mid-Point Algorithm), Line Function, Circle-Generating Algorithms(Bresenham's Algorithm and Midpoint Circle Algorithm), Properties of Circles, Ellipse-Generating Algorithms, Midpoint Ellipse Algorithm, Properties of Ellipses. Filled-Area Primitives, Scan-Line Polygon Fill Algorithm Inside-Outside Tests, Scan-Line Fill of Curved Boundary, Areas Boundary-Fill Algorithm, Flood-Fill Algorithm, Fill-Area Functions.
Two-Dimensional Geometric Transformations: Basic Transformations Translation Rotation Scaling , Matrix Representations and Homogeneous Coordinates , Composite Transformations, General Pivot-Point Rotation ,General Fixed-Point Scaling, General Scaling Directions, Concatenation Properties, General

Composite Transformations and Computational Efficiency ,Other Transformations – Reflection,Shear, Transformations Between Coordinate Systems.

Two-Dimensional Viewing : Viewing Coordinate Reference Frame, Window-to-viewport Coordinate Transformation, Clipping Operations, Point Clipping, Line Clipping(Cohen-Sutherland Line Clippings, Cyrus-Beck Line Clipping Algorithm), Polygon Clipping (Sutherland Hodgman Algorithm),Text Clipping,Curve Clipping, Exterior Clipping.

Text Book:

1. D.Hearn, Baker: Computer Graphics, Prentice Hall of India 2008.
2. D.P.Mukherjee,Fundamentals of Computer Graphics and Multi Media, PHI.

Course Title: GraphicsLab using C

CREDIT: 2 Full Marks: 50 (Internal Assessment: 10, Final Exam: 40)
Course Code: DSE-I(ii) Lab CONTACTS: 4P

Programming should be developed using C Language to implement the problems related to theoretical Paper.

Discipline Specific Electives-II(Any One)

Course Title: Optimization Techniques

CREDIT: 6 Full Marks: 50 (Internal Assessment: 10, Final Exam: 40)
Course Code: DSE-II(i) CONTACTS: 5L+1T

Introduction to Operational Research (OR): Origin & Development, Different Phases of OR study, Methodology of OR, Scope and Limitations of OR, Applications of OR.
Linear Programming: Linearly independent / dependent vectors, Basis, Convex sets, Extreme points. Graphical method. Simplex method, Artificial variable techniques- Two Phase Method; M-Charnes Method, Special cases in LPP.
Duality: Definition of the dual problem, Primal-dual relationships, Economic Interpretation of Duality, Dual simplex Method.
Transportation and assignment problems: Transportation type problem in standard L.P.form,Special features of transportation type problem, North-West Corner method,Matrix Minima method,Vogel's Approximation method, Mathematical formulation and solution of the assignment problem.
PERT/ CPM.:Introduction, Phases of project scheduling, WorkBreakdownstructure,Network (Arrow Diagram), Numbering of Events (Fulkerson's Rule), Critical Part Method, Programme Evaluation and Review Technique (PERT), Cost Analysis and Crashing the Network, Project Cost, How the Networks (PERT/CPM) help Management?, Difficulties of Using Network Methods, Applications of Network Techniques.

Text Book:

1. G. Hadley: Linear Programming. Narosa, 2002 (reprint).
2. A. Ravindran, D. T. Phillips and James J. Solberg: Operations Research-Principles and Practice, John Wiley & Sons, 2005.
3. Hamdy A. Taha: Operations Research-An Introduction, Prentice Hall, 8th Edition, 2008.
4. F.S. Hillier. G.J. Lieberman: Introduction to Operations Research- Concepts and Cases, 9th Edition, Tata McGraw Hill. 2010.
5. Gupta and Hira, Introduction to Operations research, S. Chand & Company Ltd.
6. Chakravorty and Ghosh, Linear Programming, Moulik Library.

Course Title: Computer Organization
CREDIT: 6 Full Marks: 50 (Internal Assessment: 10, Final Exam: 40)
Course Code: DSE-II(ii) CONTACTS: 5L+1T

Basic computer organization: Accumulator based CPU, disadvantages, Improvements, CPU registers (IR, PC, SP, MAR, MDR, AC), IAS computer, Von Neumann computer.
Instruction: Machine instruction, Assembly language instruction, micro instruction, Instruction Cycle, Instruction Format, 0, 1, 2, 3-address instruction, instruction types, instruction set completeness, Addressing modes, Numerical problems on Instruction format.
Stack organization: Implementation of Stack using Shift register, Application of stack in Organization.
Memory: Types of Memory (RAM, ROM, DRAM, SRAM, SAM), characteristic of memory.
Associative memory: Design and application.
Virtual memory: Concept, Mapping (Direct, Associative and Direct –associative mapping), Replacement algorithm (FIFO, LRU, LFU).
Cache memory: Concept of locality of reference, cache memory organization, Hit & miss, Write back & Write through Cache, Mapping (Direct, Associative and Set associative mapping), Numerical problems on cache mapping.
Bus Organization: Bus structure, I/O interfacing, tri-state logic, Address decoding (Absolute & Partial), Memory mapped I/O & I/O mapped I/O, Data transfer (Programmed I/O, Interrupt initiated I/O, DMA), Bus contention and bus arbitration.
CU Design: Hardwired and Micro-programmed CU design and their relative advantages & disadvantages.

Text Book:

1. M. Morris Mano, Computer System Architecture, Pearson.
2. John Hayes, Computer Architecture and Organization, McGrawHill.
3. William Stallings, Computer Organization and Architecture: Designing for Performance, Prentice Hall.

Discipline Specific Electives-III (Any One)
Course Title: Internet Technology
CREDIT: 6 Full Marks: 50 (Internal Assessment: 10, Final Exam: 40)
Course Code: DSE-III (i) CONTACTS: 5L+1T

Introduction to Internet: Evolution of Internet, concept of Intranet and Internet, Applications of Internet, Types of Connectivity such as dial – up, leased, VSAT. etc., Internet Server and Clients module in various Operating Systems,TCP/IP, Introduction to RFC, Addressing in Internet – IP and Domains, major features of IP, IP datagram, major IP services, IP source routing, value of the transport layer, TCP, major features of TCP, passive and active operation, Internet Service Providers.
E-mail and List-servers: E-mail Networks, E-mail protocols(X.400, SMTP, UUCP), Format of an E- mail message , Description of E-mail Headers, E- mail contents and encoding, E-mail routing, List servers, E-mail clients, POP-3, IMAP-4.
File Transfer Protocol: Introduction to FTP, public domain Software, Types of FTP Servers, FTP clients, Common Commands.
Telnet: Telnet protocol, Server daemon, Telnet clients, Terminal emulation
Usenet and Internet Relay Chart Introduction to World Wide Web: Evolution of WWW, Basics Features, WWW Browsers, WWW servers, HTTP & URL's
WWW Browsers: Basic features, Bookmarks, history. Progress indicators, Personalization of Browsers, Printing displayed pages and forms, Saving Web pages, Netscape Communicators, Internet Explorer, Search and Downloads.

Text Book:

1. Data and Computer communication by William Stallings, 6th Edition, Pearson Education
2. Computer Networks by Tanenbaum, Pearson Education

Course Title: Animation & Multimedia

CREDIT: 6 Full Marks: 50 (Internal Assessment: 10, Final Exam: 40)

Course Code: DSE-III(ii) CONTACTS: 5L+1T

Multimedia: Introduction to multimedia, components, uses of multimedia, multimedia applications, virtual reality.

Text: Fonts & Faces, Using Text in Multimedia, Font Editing & Design Tools,Hypermedia& Hypertext.

Images: Still Images – bitmaps, vector drawing, 3D drawing & rendering, naturallight& colors, computerized colors, color palettes, image file formats.

Sound: Digital Audio, MIDI Audio, MIDI vs Digital Audio, Audio File Formats.

Video: How video works, analog video, digital video, video file formats,videoshooting and editing.

Animation: Principle of animations, animation techniques, animation file formats.

Internet and Multimedia: www and HTML, multimedia on the web – web servers, web browsers, web page makers and site builders.

Making Multimedia: Stages of a multimedia project, Requirements to make good multimedia, Multimedia Hardware - Macintosh and Windows production Platforms, Hardware peripherals - Connections, Memory and storage devices, Multimedia, software and Authoring tools.

Text Book:

1. Tay Vaughan, Multimedia: Making it work‖, TMH, Eighth edition, 2011
2. Ralf Steinmetz and KlaraNaharstedt, Multimedia: Computing, Communications Applications‖, Pearson.2012
3. Keyes, Multimedia Handbook‖, TMH,2000.
4. K. Andleigh and K. Thakkar, Multimedia System Design‖, PHI.2013.

Semester-VI

Skill enhancement Course (Any One)

Course Title: Visual Basic Lab
CREDIT: 2 **Full Marks: 50 (Internal Assessment: 10, Final Exam: 40)**
Course Code: SEC-4 (i) **CONTACTS: 4P**

Simple applications development in Visual Basic environment.
Example: Simple input/output using Textbox, labels, inputbox, msgbox, command button.
Control logic using if then else, select case. Looping using do while, do until, for. Library functions, user-defined functions and subroutines, Problems on Strings. Arrays- data array and control array. Problems using list box, combo box, check box, option button, timer. Design and implement Pocket Calculator. Database connectivity using adodc and adodb.

Text Book:
1. Mastering VB 6.0, Evangelos Petroutsos, BPB Publication.

Course Title: PHP Programming Lab
CREDIT: 2 **Full Marks: 50 (Internal Assessment: 10 Final Exam: 40)**
Course Code: SEC-4 (i) **CONTACTS: 4P**

HTML, Cascading Style Sheets (CSS).
PHP variables, constants, data types, operators, statements, functions, state management, string manipulation, regular expressions, file handling and data storage, PHP and MySQL Databases, Security. Templates Image Generation and Manipulation.

Text Book:
1. HTML 5 Black Book: Covers CSS3, Javasvript, XML, XHTML, AJAX, PHP and jQuery, Kogent Learning Solutions Inc.
2. Web Development in PHP, MYSQL, Javascript, HTML & CSS: Step-by-Step Web Project, Riaz Ahmed, Createspace Independent Pub.

Discipline Specific Electives-IV (Any One)
Course Title: Core JAVA
CREDIT: 4 **Full Marks: 50 (Internal Assessment: 10, Final Exam: 40)**
Course Code: DSE-IV(i) **CONTACTS: 4L**

Introduction: JAVA as internet language. A first simple program. Entering the program, Compiling the program, control statements, using blocks of code, lexical issues-white space, identifiers, literals, comments, separators, The Java keyword- The java class libraries, data types, variables and arrays, the simple types, integers-byte, short, int, long, floating point types-float, double, characters, Booleans. A closer look at literals-integer literals, floating point literals, Boolean literals,character literals, string literals,

variables – declaring a variable, dynamic initialization, the scope and lifetime of variables, type conversion and casting – java's automatics conversions, casting incompatible types, automatic type promotion in expressions, the type promotion rules, arrays-one dimensional arrays, multidimensional arrays, alternative array declaration syntax. Operators-assignment operators, increment and decrement, the bitwise operators, relational operators, Boolean logical operators, the assignment operator, the ?operator, operator precedence, using parentheses, control statements-Java's selection statements, if, switch, interaction statements-while, do-while, for, some for loop variations, nested loops, jump statements-using break, using continue, return.

Introduction Classes: class fundamentals, the general form of a class, a simple class, declaring objects, a closer look at new, assigning object reference variables, introducing methods, adding a method, the box class, returning a value, adding a method to the box class, constructors, parameterized constructors, the this keyword, instance variable hiding, garbagecollection, the finalize method, a stack class, a closer look at methods and classes, overloading methods, overloading constructors. Using object as parameters, argument passing, returning objects, introducing access control, understanding static, introducing final, arrays revised., exploring the string class, using command line arguments, inheritance, inheritance basics, a more practical example, a superclass variable can reference a subclass object, using super, using super to call superclass constructors, a second use for super, creating a multilevel hierarchy, when constructor are called, method overriding, dynamic method dispatch, overridden methods, applying methods overriding, using abstract classes, using final with inheritance, using final to prevent overriding, using final to prevent inheritance, the object class.

Package and interfaces: Defining a package, understanding class path, a short package example, access protection, an access example, importing packages- interface-defining an interface, implementing interfaces, applying interfaces, variables in interfaces, interface can be extended.

Exception Handling: Exception fundamentals, exception types, uncaught exceptions, using try and catch, displaying a description of an exception, multiple catch clauses, nested try statements, throw, throws, finally, java's built-in exceptions-creating you own exception subclasses, using exceptions, multithreaded programming.

Threads: The java's thread model, thread priorities, synchronization, message, the thread class and the runnable interface, the main thread, creating a thread, implementing runnable, extending thread, closing an approach, creating multiple thread, thread priorities, synchronization, using synchronized methods, the synchronized statement, inter-thread communication, using multithreading.

Stream classes: The predefined streams, reading console input, writing console output, reading and writing files, the transient and volatile modifiers, using instance of native methods, problem with native methods.

String handling: The string constructor, string length, special string operations-string literals, string concatenation, string concatenation with other data types, string conversion, character extraction, string comparison, searching strings, modifying a string-data conversion using string buffer constructors.

Wrappers: Number, double and float, integer and long, character, Boolean, process, runtime, memory management, executing other programs, system-using current time limits to time, program execution, using array copy, environment properties, object, using clone and the cloneable interface, class, class loader, math-transcendental functions, exponential functions, rounding functions, miscellaneous math methods, classes, input stream, output stream file input stream, file output stream.

Text Book:

1. E. Balaguruswamy, Programming with Java, 4th Edition, McGraw Hill.2009.
2. John R. Hubbard,"Programming with JAVA, Schaum's Series, 2nd Edition, 2004.
3. Herbert Schildt, The Complete Reference Java 2, TMH

Course Title: Programming in JAVALab

CREDIT: 2 **Full Marks: 50 (Internal Assessment: 30, Final Exam: 20)**

Course Code: DSE-IV(i) Lab **CONTACTS: 4P**

Programming should be developed using JAVA Language to implement the problems related to theoretical Paper.

Course Title: Microprocessor
CREDIT: 4 Full Marks: 50 (Internal Assessment: 10, Final Exam: 40)
Course Code: DSE-IV(ii) CONTACTS: 4L

Microprocessor architecture: Internal architecture, system bus architecture, memory and I/O interface.
Microprocessor programming: Register Organization, Instruction Formats, Addressing Modes, Instruction Cycle, Clock Cycles, Timing Diagrams, assembly language programming.
Interfacing: Memory address decoding, cache memory and cache controllers, I/O interface, keyboard, display, timer, Interrupt Handling, Methods of Interrupts,InterruptController, DMA Controller, Video Controllers, communication interfaces.
Case Studies: 8085 and 8086 microprocessor.

Text Book:
1.RameshGankar, "Microprocessor Architecture, Programming, and Applications with the 8085", PIP (India)
2. Barry B. Brey : The Intel Microprocessors : Architecture, Programming and Interfacing. Pearson Education, Sixth Edition,2009.
3. Walter A Triebel, Avtar Singh; The 8088 and 8086 Microprocessors Programming, Interfacing, Software, Hardware, and Applications. PHI, Fourth Edition 2005.

Course Title: MicroprocessorLab
CREDIT: 2 Full Marks: 50 (Internal Assessment: 30, Final Exam: 20)
Course Code: DSE-IV(ii) Lab CONTACTS: 4P

Programming should be developed using 8085 assembly language to implement the problems related to theoretical Paper.

Discipline Specific Electives-V(Any One)

Course Title: Software Engineering
CREDIT: 6 Full Marks: 50 (Internal Assessment: 10, Final Exam: 40)
Course Code: DSE-V(i) CONTACTS: 5L+1T

Introduction: Software engineering discipline – evolution and impact, Program vs S/W, Emergence of S/W engineering (Introduction to Control based design, Data structure oriented design, data flow oriented design, object oriented design).
Software life cycle: Usefulness, Life cycle Model -Classical water fall model, Iterative waterfall model, prototype model, spiral model, comparisons.
Software Requirement Specification: Role of system analyst, Need, Components and characteristic of SRS, Problems without a SRS, SRS document for Simple problems.
Software design: Cohesion & Coupling, S/W design Approach - Function oriented approach (DFD, Structure chart, Transformation of DFD into Structure chart), Object oriented approach (UML diagram, Use case model, class diagram, Interaction diagram)
Coding: Coding standards, Code review - Code walk through, Code Inspection, Clean room testing.
Testing: Unit Testing (Driver and Stub Module, Black box testing [Equivalence class Partitioning and Boundary value analysis], White box testing [Statement coverage, Edge/branch coverage, condition

coverage, path coverage]), Integration Testing (Big bang, Top down, Bottom up, Mixed approach), Verification and Validation of Software.
Maintenance: Characteristics, Types (corrective, adaptive and perfective), Software maintenance process model (Reverse engineering cycle followed by forward engineering model).
Software Cost and Time estimation: Functions points, Issues in software cost estimation, Introduction to the Rayleigh curve, Algorithmic cost models (COCOMO).

Text Book:

1. R.S. Pressman, Software Engineering: A Practitioner's Approach (7th Edition), McGraw-Hill, 2009.
2. Rajib Mall, Fundamentals of Software Engineering, PHI.

Course Title: Computer Networks

CREDIT: 6 **Full Marks: 50 (Internal Assessment: 10, Final Exam: 40)**
Course Code: DSE-V(ii) **CONTACTS: 5L+1T**

Introduction: Communication systems, Analogue data, digital data, Communication channels, Synchronous data, Asynchronous data. Concepts of LAN, MAN and WAN. Modes of data transfer (simplex, half duplex,ful duplex).
Multiplexing: FDM (Multiplexing and De-multiplexing Process, Applications), TDM (Time Slot and Frames, Interleaving, Bit Padding, Applications),WDM.
Transmission Media: Guided Media(Twisted Pair, Co-Axial Cable, Fiber Optics Cable); Unguided Media(Radio Waves, Microwaves, Infrared, Satellite Communication); NIC.
Switching: Circuit, Packet and Message Switching; Comparisons.
Modems: DSL, Cable Modems.
Network Software: OSI and TCP/IP Models, Functions of each layers.
Data Link Layer: Error Detection and Correction (Parity, Checksum, CRC, Humming Code); MAC Layer; Stop-And-Wait ARQ, Sliding Window Protocol, Selective Repeat ARQ, HDLC Protocol; ALOHA (Pure and Slotted), CSMA/CD Protocol, Polling; Token Passing; CDMA; Ethernet, Token Bus, Token Ring, ATM.
Network Layer: IP Addressing and Classes of IP Address; Subnet; Static and dynamic routing; ARP; IP; ICMP; unicast and multicast routing protocols;
Transport layer: process-to-process delivery; UDP; TCP; Congestion control protocols.
Connecting Devices: Repeaters, Hub, Bridges, Switch, Router and Gateway.
Application Layer: client server model; FTP, HTTP, SMTP, Telnet etc protocols.

Text Book:

1. B. A. Forouzan: Data Communications and Networking, Fourth edition, THM ,2007.
2.A. S. Tanenbaum: Computer Networks, Fourth edition, PHI , 2002
3.WilliamStallings:Data and Computer Communications,Eight Edition, Pearson.

Discipline Specific Electives-VI (Any One)

Course Title: E-Commerce

CREDIT: 6 Full Marks: 50 (Internal Assessment: 10, Final Exam: 40)
Course Code: DSE-VI (i) CONTACTS: 5L+1T

E-Business Framework: Definition of E-Business, Origin of E-Business, History of the Internet, E-Business Opportunities for Businesses, Working of E-Business, E-Business Vs the Traditional Business Mechanism, Advantages of E-Business, Disadvantages of E-Business, Main Goals of E-Business

E-commerce Infrastructure: Need for an Intelligent Website, technology Infrastructure Required, Basic Web Languages for Web Designing, Corporate Strategic Infrastructure Required, Miscellaneous Website Design Tips

Business Models: Evolution of Internet Business Models, Business Models in Practice, Business Model: The Six Components

Security In Electronic Business: Intranet and Extranet Security: Threats and Protection, Protection Methods, Data and Message Security, Firewalls

Encryption: Cryptography, Encryption, Digital Signature, Virtual Private Network

E-Payment Systems: B2B Electronic Payments, Third-Party Payment Processing, Electronic Payment Gateway–Security Standard for Electronic Payment System

E-Marketing: Challenges of Traditional Marketing, Retailing in E-Business Space, Internet Marketing, Advertisement and Display on the Internet, E-Business for Service Industry

Policy and Implementation: Legal and Ethical Policy Issues: Protection of Privacy and Intellectual Property, Strategy Planning for E-Business

Mobile Commerce: Overview of M-Commerce - Wireless Application Protocol (WAP), Generations of Mobile Wireless Technology, Components of Mobile Commerce, Networking Standards for Mobiles.

HTML: Document overview, Header elements, Section Headings, Block- oriented elements, Lists, Inline elements, Visual Mark-up, Hypertext links, Uniform Resource Locators, (URL's), Images, Forms, Tables, special characters.

Text Book:

1. E-commerce - Paul A. Murphy, THM.

Course Title: Intelligent System

CREDIT: 6 Full Marks: 50 (Internal Assessment: 10, Final Exam: 40)
Course Code: DSE-VI (ii) CONTACTS: 5L+1T

Introduction: Overview of Artificial intelligence- Problems of AI, AI technique, Tic - Tac - Toe problem.
Intelligent Agents: Agents & environment, nature of environment, structure of agents, goal based agents, utility based agents, learning agents.
Problem Solving: Problems, Problem Space & search: Defining the problem as state space search, production system, problem characteristics, issues in the design of search programs.

Search techniques: Solving problems by searching:problem solving agents, searching for solutions; uniform search strategies: breadth first search, depth first search, depth limited search, bidirectional search, comparing uniform search strategies.

Heuristic search strategies: Greedy best-first search, A* search, memory bounded heuristic search: local search algorithms & optimization problems: Hill climbing search, simulated annealing search, local beam search, genetic algorithms; constraint satisfaction problems, local search for constraint satisfaction problems.

Adversarial search: Games, optimal decisions & strategies in games, the minimax search procedure, alpha-beta pruning, additional refinements, iterative deepening.

Knowledge & reasoning: Knowledge representation issues, representation & mapping, approaches to knowledge representation, issues in knowledge representation.

Using predicate logic: Representing simple fact in logic, representing instant & ISA relationship, computable functions & predicates, resolution, natural deduction.

Representing knowledge using rules: Procedural verses declarative knowledge, logic programming, forward verses backward reasoning, matching, control knowledge.

Probabilistic reasoning: Representing knowledge in an uncertain domain, the semantics of Bayesian networks, Dempster-Shafer theory, Fuzzy sets & fuzzy logics.

Natural Language processing: Introduction, Syntactic processing, semantic analysis, discourse & pragmatic processing.

Learning: Forms of learning, inductive learning, learning decision trees, explanation based learning, learning using relevance information, neural net learning & genetic learning.

Expert Systems: Representing and using domain knowledge, expert system shells, knowledge acquisition. Basic knowledge of programming language like Prolog & Lisp.

Text Book:

1. Artificial Intelligence: A Modern Approach, Stuart Russel Peter Norvig, Pearson
2. Introduction to Artificial Intelligence & Expert Systems, Patterson, PHI
3. Logic & Prolog Programming, SarojKaushik, New Age International
4. Artificial Intelligence, Russel, Pearson

Kazi Nazrul University

Curriculum

Generic Electives Offered by Computer Science Department to Other Honours Courses

Semester	Paper Code	Paper Name	(L-T-P)	Credit	Marks
I	GE-I	**Computer Fundamentals**	**4-0-0**	**4**	**50**
	GE-I Practical	**PC Software Lab**	**0-0-4**	**2**	**50**
II	GE-II	**Programming in C**	**4-0-0**	**4**	**50**
	GE-II Practical	**C Programming Lab**	**0-0-4**	**2**	**50**
III	GE-III	**Introduction to Database Management Systems (DBMS)**	**4-0-0**	**4**	**50**
	GE-III Practical	**Database Lab**	**0-0-4**	**2**	**50**
IV	GE-IV	**Computer Networks and Internet Technologies**	**4-0-0**	**4**	**50**
	GE-IV Practical	**Internet Technologies Lab (HTML)**	**0-0-4**	**2**	**50**

Note: Discrete Mathematics as GE-I was offered by Computer Science Department for academic session 2016-2017 only.

GE-I: Computer Fundamentals

CONTACTS: 4L

CREDIT: 4 Full Marks: 50 (Internal Assessment: 10, Final Exam: 40)

Introduction: Introduction to computer system, uses, types.
Data Representation: Number systems and character representation, binary arithmetic.
Boolean algebra: Fundamentals of Boolean algebra, Switches and Inverters, Functionally Complete Gates (AND, OR, NOT), NAND, NOR, Switching function and Boolean Function. De Morgan's Theorem, Minterms, Maxterms, Truth table and minimization of switching function up to four variables, Algebraic and K-map method of Logic circuit synthesis: Two-level and Multi-level.
Human Computer Interface: Types of software, Operating system as user interface, utility programs.

Devices: Input and output devices (with connections and practical demo), keyboard, mouse, joystick, scanner, OCR, OMR, bar code reader, web camera, monitor, printer, plotter
Memory: Primary, secondary, auxiliary memory, RAM, ROM, cache memory, hard disks, optical disks
Computer Organization and Architecture: C.P.U., registers, system bus, main memory unit, cache memory, Inside a computer, SMPS, Motherboard, Ports and Interfaces, expansion cards, ribbon cables, memory chips, processors.
Problem Solving: Flow Charts, Decision Tables and Pseudo codes.
Introduction to Programming Languages: Machine Language, Assembly Language, High Level Language.

Books*:*

1. Computer Fundamentals by P.K. Sinha and P.Sinha, BPB Publication
2. Digital Logic and Computer Design by M.Morris Mano, PHI
3. Modern Digital Electronics : R.P. Jain

GE-I Practical: PC Software Lab

CONTACTS: 4P
CREDIT: 2 Full Marks: 50 (Internal Assessment: 30, Final Exam: 20)

Microsoft Office (MS Word, MS Excel and MS PowerPoint)

GE-II: **Programming in C**

CONTACTS: 4L
CREDIT: 4 Full Marks: 50 (Internal Assessment: 10, Final Exam: 40)

Introduction: History of C, Overview of Procedural Programming, Using main() function, Compiling and Executing Simple Programs in C.
Data Types, Variables, Constants, Operators and Basic I/O
Declaring, Defining and Initializing Variables, Scope of Variables, Using Named Constants, Keywords, Data Types, Casting of Data Types, Operators (Arithmetic, Logical and Bitwise), Using Comments in programs, Character I/O (getc, getchar, putc, putcharetc), Formatted and Console I/O (printf(), scanf()), Using Basic Header Files (stdio.h, conio.hetc).
Expressions, Conditional Statements and Iterative Statements
Simple Expressions in C(including Unary Operator Expressions, Binary Operator Expressions), Understanding Operators Precedence in Expressions, Conditional Statements (if construct, switch-case construct), Understanding syntax and utility of Iterative Statements (while, do-while, and for loops), Use of break and continue in Loops, Using Nested Statements (Conditional as well as Iterative)
Functions and Arrays
Utility of functions, Call by Value, Call by Reference, Functions returning value, Void functions, Inline Functions, Return data type of functions, Functions parameters, Differentiating between Declaration and Definition of Functions, Command Line Arguments/Parameters in Functions, Functions with variable number of Arguments.
Creating and Using One Dimensional Arrays (Declaring and Defining an Array, Initializing an Array, Accessing individual elements in an Array, Manipulating array elements using loops), Use Various types of arrays (integer, float and character arrays / Strings) Two-dimensional Arrays (Declaring, Defining and

Initializing Two Dimensional Array, Working with Rows and Columns), Introduction to Multi-dimensional arrays

Derived Data Types (Structures and Unions)

Understanding utility of structures and unions, Declaring, initializing and using simple structures and unions, Manipulating individual members of structures and unions, Array of Structures, Individual data members as structures, Passing and returning structures from functions, Structure with union as members, Union with structures as members.

File I/O, Preprocessor Directives

Opening and closing a file, Reading and writing Text Files, Understanding the Preprocessor Directives.

Books:

1. C Programming - Karnighan, & Ritchie (PHI)
2. Programming in C-B.S. Gottfried (Sahaum Series)
3. Programming in ANSI C- E. Balaguruswami (TMH)

GE-II Practical: C Programming Lab

CONTACTS: 4P

CREDIT: 2 Full Marks: 50 (Internal Assessment: 30, Final Exam: 20)

Programming should be developed using C Language to implement the problems related to theoretical Paper.

Sample Problems:

1. Write a program to find greatest of three numbers.

2. Write a program to find gross salary of a person

3. Write a program to find grade of a student given his marks.

4. Write a program to find divisor or factorial of a given number.

5. Write a program to print first ten natural numbers.

6. Write a program to print first ten even and odd numbers.

7. Write a program to find grade of a list of students given their marks.

8. Create Matrix class. Write a menu-driven program to perform following Matrix operations (2-D array implementation):
a) Sum b) Difference c) Product d) Transpose

GE-III: Introduction to Database Management System

CONTACTS: 4L

CREDIT: 4 Full Marks: 50 (Internal Assessment: 10, Final Exam: 40)

Database: Introduction to database, relational data model, DBMS architecture, data independence, DBA, database users, end users, front end tools.

E-R Modeling: Entity types, entity set, attribute and key, relationships, relation types, E- R diagrams, database design using ER diagrams.

Relational Data Model: Relational model concepts, relational constraints, primary and foreign key, Relational Algebra, normalization: 1NF, 2NF, 3NF .

Structured Query Language: SQL queries, create a database table, create relationships between database tables, modify and manage tables, queries, create view.

Transaction processing, Security, Integrity: Introduction to Transaction processing, Elementary Concepts of Security, Integrity.

Books*:*

1. Database System Concepts by Avi Silberschatz, Henry F. Korth and S. Sudarshan, McGraw-Hill Education.
2. Database Management System by Arun Majumdar and Pritimoy Bhattacharyya, McGraw-Hill Education.
3. An Introduction to Database Systems by C.J. Date, A.Kannan, S.Swamynathan, Pearson Education

GE-III Practical: Database Lab

CONTACTS: 4P

CREDIT: 2 Full Marks: 50 (Internal Assessment: 30, Final Exam: 20)

Relational DBMS (Oracle/SQL Server) Laboratory related to theoretical Paper.

Sample Problems:

1) Create a database having two tables with the specified fields, to computerize a library system of a University College.

LibraryBooks (Accession number, Title, Author, Department, PurchaseDate, Price) IssuedBooks (Accession number, Borrower)

a) Identify primary and foreign keys. Create the tables and insert at least 5 records in each table.
b) Delete the record of book titled ―Database System Concepts‖.
c) Change the Department of the book titled ―Discrete Maths‖ to ―CS‖.
d) List all books that belong to ―CS‖ department.
e) List all books that belong to ―CS‖ department and are written by author ―Navathe‖.
f) List all computer (Department=‖CS‖) that have been issued.
g) List all books which have a price less than 500 or purchased between ―01/01/1999‖ and ―01/01/2004‖.

2) Create a database having three tables to store the details of students of Computer Department in your college.

Personal information about Student (College roll number, Name of student, Date of birth, Address, Marks(rounded off to whole number) in percentage at 10 + 2, Phone number) Paper Details (Paper code, Name of the Paper)

Student's Academic and Attendance details (College roll number, Paper code, Attendance, Marks in home examination).

a) Identify primary and foreign keys. Create the tables and insert at least 5 records in each table.
b) Design a query that will return the records (from the second table) along with the name of student from the first table, related to students who have more than 75% attendance and more than 60% marks in paper 2.
c) List all students who live in ―Delhi‖ and have marks greater than 60 in paper 1.
d) Find the total attendance and total marks obtained by each student.
e) List the name of student who has got the highest marks in paper 2.

3) Create the following tables and answer the queries given below:
Customer (CustID, email, Name, Phone, ReferrerID)
Bicycle (BicycleID, DatePurchased, Color, CustID, ModelNo) BicycleModel (ModelNo, Manufacturer, Style)
Service (StartDate, BicycleID, EndDate)

a) Identify primary and foreign keys. Create the tables and insert at least 5 records in each table.
b) List all the customers who have the bicycles manufactured by manufacturer ―Honda‖.
c) List the bicycles purchased by the customers who have been referred by customer ―C1‖.
d) List the manufacturer of red colored bicycles.
e) List the models of the bicycles given for service.

GE-IV: Computer Networks and Internet Technologies

CONTACTS: 4L
CREDIT: 4 Full Marks: 50 (Internal Assessment: 10, Final Exam: 40)

Network Models: Client/ server network and Peer-to-peer network, OSI, and TCP/IP layers and functionalities.

Transmission Media: Introduction, Guided Media: Twisted pair, Coaxial cable, Optical fiber. Unguided media: Microwave, Radio frequency propagation, Satellite.

LAN Topologies: Ring, bus, star, mesh and tree topologies.

Network Devices: NIC, repeaters, hub, bridge, switch, gateway and router.

Internet Terms: Web page, Home page, website, internet browsers, URL, Hypertext, ISP, Web server, download and upload, online and offline.

Internet Applications: www, telnet, ftp, e-mail, social networks, search engines, Video Conferencing, e-Commerce, m-Commerce.

Books*:*
1. Data Communications and Networking by Behrour A. Forouzan, 4th Edition, TMH
2. Data and Computer communication by William Stallings, 6th Edition, Pearson Education
3. Computer Networks by Tanenbaum, Pearson Education

GE-IV Practical: Internet Technologies Lab (HTML)

CONTACTS: 4P

CREDIT: 2 Full Marks: 50 (Internal Assessment: 30, Final Exam: 20)

Practical exercises based on concepts using HTML.

Sample Problems:

1. Create HTML document with following formatting – Bold, Italics, Underline, Colors, Headings, Title, Font and Font Width, Background, Paragraph, Line Brakes, Horizontal Line, Blinking text as well as marquee text.

2. Create HTML document with Ordered and Unordered lists, Inserting Images, Internal and External linking

3. Create HTML document with Table.