KRISHNA KANTA HANDIQUI STATE OPEN UNIVERSITY
(KKHSOU)

PROGRAMME PROJECT REPORT

ON

MASTER OF SCIENCE IN INFORMATION TECHNOLOGY (M.Sc. IT)

Submitted to

UNIVERSITY GRANT COMMISSION

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NEW DELHI – 110 002

Submitted by

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Guwahati, Assam

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ANNEXURE I
M.Sc.IT PROGRAMME STRUCTURE

Course Code	Sem	M.Sc.IT	Marks	Credit
M.SC.IT(S1)01	1st	Computer Fundamentals and PC Software	20a+50t+30p	4
M.SC.IT(S1)02		Digital Techniques	30a+70t	4
M.SC.IT(S1)03		Computer Programming using C	20a+50t+30p	4
M.SC.IT(S1)04		Fundamentals of Networking and Web Technology	20a+50t+30p	4
M.SC.IT(S2)05	2nd	Computer Organization and Architecture	30a+70t	4
M.SC.IT(S2)06		Data Structure through C Language	20a+50t+30p	4
M.SC.IT(S2)07		Fundamentals of Database Management System	20a+50t+30p	4
M.SC.IT(S2)08		Open Source Software / *** Minor Project**	20a+50t+30p / ***100**	4
M.SC.IT(S3)09	3rd	Introduction to Discrete Mathematics and Formal Languages and Automata	30a+70t	4
M.SC.IT(S3)10		Object-Oriented Programming through C++	20a+50t+30p	4
M.SC.IT(S3)11		Operating System	30a+70t	4
M.SC.IT(S3)12		System Analysis and Design	30a+70t	4
M.SC.IT(S4)13	4th	Programming in Java	20a+50t+30p	4
M.SC.IT(S4)14		Computer Graphics	30a+70t	4
M.SC.IT(S4)15		Linux System Administration	20a+50t+30p	4
M.SC.IT(S4)16		**Major Project**	200	8
Total Marks:			**1700**	**68**

- For theory courses, the mark distribution is 30a+70t i.e., 30 marks for Home assignment and 70 marks for theory. For courses having practical, the marks distribution is 20a+50t+30p i.e., 20 marks for Home assignment, 50 marks for theory and 30 marks is for practical.
- M.Sc.IT programme is a modular programme at KKHSOU. Learners not able to complete the whole M.Sc.IT programme will have to submit a Minor Project work in the second semester in place of the course Open Source Software to get the Post Graduate Diploma in Computer Science (PGDCS).

1 credit = 30 hours of learning

4 credit=30*4=120 hours

ANNEXURE II
M.SC.IT DETAILED COURSE WISE SYLLABUS

M.SC.IT (S1) 01: Computer Fundamentals and PC Software
4 credits: 120 hours of learning

Course Objectives:

To enable the learners to learn about

- the evolution, generation, classifications and applications of computer
- different operating systems
- functionalities of different MS-Office packages
- cyber security

Unit 1: Introduction to Computer [5 hours, 5 marks]
Block Diagram of Computer, Evolution, Generations, Classification and its Application

Unit 2: Number System [10 hours, 8 marks]
Representation of numbers (only a brief introduction to be given) and characters in computer, Binary, Hexadecimal, Octal, BCD, ASCII, EDCDIC and Gray codes, Conversion of bases, Representation of signed integers, Sign magnitude, 1's complement and 2's complement representation, Arithmetic operations using 2„s complement representation and conditions for overflow/underflow and its detection.

Unit 3: Basic Components of Computer [7 hours, 8 marks]
Concept of Bit and Byte; CPU, ALU, CU; Computer Memory: Primary and Secondary; Input/Output Devices; Buses: Address, Data and Control.

Unit 4: Introduction to Computer Security [5 hours, 5 marks]
Computer Virus, Worm, SpyWare, Malware, Trojan horse, Antivirus Software

Unit 5: Hardware Configuration [7 hours, 5 marks]
Different hardware configuration (Laptop/desktop), Typical RAM/ Hard disk size, Mother board series, different OEM(original equipment manufacturer), Processor series, FCC & UL for quality measure, Introduction to different standard ports/buses and display technology.

Unit 6: Introduction to OS [7 hours, 5 marks]
Definition and functions of an Operating System, Types of OS (Single User, Multi user, Single tasking, Multitasking, Real time, Network OS, Distributed OS)

Unit 7: MS DOS Operating System [7 hours, 6 marks]
Introduction to DOS, System files of DOS, concept of Booting, Files and Directory Structure, Concept of Paths, Internal and External commands, Batch File.

Unit 8: MS Windows Operating System [7 hours, 6 marks]
Features of Windows 7, Exploring Components of Windows: The Desktop, The Icons, Working with Windows, The Start Menu and Taskbar, Quiting Windows; Customizing the Desktop, Files and Folders.

Unit 9: LINUX Operating System [10 hours, 8 marks]
Open Source and Free Software, Advantages and Disadvantages of Linux Operating System, Concept of Path, Basic Linux Commands, File Permission, Text Editor vi.

Unit 10: Word Processor -Part I [10 hours, 8 marks]
Starting MS-Word, Document Window and its Components, Different Bars, Document View, Creating a New Document, Saving a Document, Opening an Existing Document, Exiting MS-Word, Working with Text, Working with Paragraph, Bullets and Numbering, Find and Replace, Copy, Cut and Paste

Unit 11: Word Processor-Part II [10 hours, 8 marks]
Spelling and Grammar Checking, Undo and Redo option, Header and Footer, Page Setup, Printing Documents, Inserting Picture, Working with Tables: Inserting Table, Deleting Table, Traversing Table, Selecting a Table, Rows and Columns, Deleting Rows and Columns, Merge and Split Cells; Creating Multiple Columns

Unit 12: Spreadsheet-Part I [10 hours, 7 marks]
Starting MS-Excel, Working with Toolbars, Row, Column and Cell, Working with Excel: Creating a New Workbook, Working with Cells and Fonts, Merging Cells, Inserting and Deleting Rows and Columns; Saving a Workbook, Closing a Workbook;

Unit 13: Spreadsheet-Part II [10 hours, 8 marks]
Different Operators used in Excel; Working with Formula and Functions; Sorting Data; Working with Charts.

Unit 14: Introduction to Documentation and Presentation [10 hours, 8 marks]
Starting MS-PowerPoint, Creating a New Presentation, Working with Slides, Applying Text and Graphics, Applying Themes, Customizing Slide Show, Saving, Running and Closing a Presentation, Opening an Existing Presentation

Unit 15: Threats and Legal Framework [5 hours, 5 marks]
Cyber Crimes against Individuals, Institution and State, Hacking , Digital Forgery, Cyber Stalking/Harassment, Cyber Pornography, Identity Theft & Fraud, Cyber terrorism, Cyber Defamation, Different offences under IT Act, 2000.

Reference Books:

1. Sinha, P. K., & Sinha, P. (2010). Computer fundamentals (Vol. 4). BPB publications.
2. Ram, B. (2000). Computer fundamentals: architecture and organization. NewAge International.
3. ITL Education Solutions Limited, & Sargunar, J. (2011). Introduction to Computer Science. Pearson Education India.
4. Chander, H. (2012). Cyber laws and IT protection. PHI Learning Pvt. Ltd.
5. Singh, K. K. (2011). Information security and cyber law. kk singh.
6. Godbole, N., & Belapure, S. (2011). Cyber Security: Understanding Cyber Crimes, Computer Forensic and Legal Perspective.

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M.SC.IT (S1) 02: Digital Techniques
4 credits: 120 hours of learning

Course Objectives:

To enable the learners to learn about

- different number systems and their conversions, Boolean Algebra
- different logic gates and formation of logic circuits
- the concept of combinational and sequential circuits
- registers, counters and computer memory

Unit 1: Introduction to Number Systems [8 hours, 5 marks]
Decimal, Binary, Hexadecimal and Octal number system, Number system conversion

Unit 2: Binary Arithmetic [8 hours, 6 marks]
Complement: r's and (r-1)'s complement, Binary addition, Binary subtraction, Binary Multiplication, Binary division.

Unit 3: Data Representation [8 hours, 6 marks]
Fixed Point representation and Floating point representation

Unit 4: Code Conversion Technique [8 hours, 5 marks]
Gray code, BCD, Code conversion technique, ASCII, EBCDIC, Unicode, ISO

Unit 5: Boolean algebra [8 hours, 5 marks]
Introduction, Properties of Boolean Identities, Properties of Positive and Negative Logic

Unit 6: De-Morgan's Theorem and Application [6 hours, 6 marks]
De-Morgan's Theorem, Application of De-Morgan's theorem.

Unit 7: Basic Logic Gates [6 hours, 5 marks]
Logic Gates: AND, OR, NOT.

Unit 8: Universal Gates [10 hours, 5 marks]
NAND, NOR, XOR; Conversion of the Logic Gates, NAND and NOR Implementation of Basic Gates.

Unit 9: Introduction to IC [6 hours, 6 marks]
LSI, MSI, VLSI.

Unit 10: Reduction Techniques [8 hours, 10 marks]
Boolean Expression, Simplification of Boolean expression by Algebraic method and Karnaugh Map, SOP, POS, Standard and Canonical form, Conversion of SOP to POS and vice-versa, Reduction upto 3-variables.

Unit 11: Combinational Circuit [12 hours, 8 marks]
Definition and Properties of Combinational Circuit, Introduction to Multiplexer, 4-to-1 multiplexer, Demultiplexer, Encoder, Decoder,

Unit 12: Binary Arithmetic Circuits [6 hours, 7 marks]
Half adder, Full adder, Binary Half subtractor, Full subtractor

Unit 13: Sequential Circuit [12 hours, 10 marks]
Definition and Properties of Sequential Circuit, Block Diagram of Sequential Circuit, Types of Sequential Circuit, Introduction to Flip-Flop and its different types: RS, JK; Master-Slave JK Flip-Flop.

Unit 14: Registers and Counters [8 hours, 8 marks]
Shift Register: Introduction, Properties and Applications, Types of Shift Registers: SISO, PISO, SIPO, PIPO; Counter, Synchronous and Asynchronous Counter, Limitations of Asynchronous Counter, Frequency Division Counter.

Unit 15 Memory Types [6 hours, 7 marks]
Random Access Memory (RAM), Read Only Memory (ROM), Static RAM, Dynamic RAM, Volatile and Non-Volatile memory.

Reference Books:

1. Mano, M.M. (2017), Digital Logic and Computer Design, Pearson Education India
2. Kumar,A.A., (2014), Fundamental of Digital Circuit, PHI Learning Pvt. Ltd.
3. Sinha, P. K. and Sinha P. (2010), Computer Fundamentals, BPB Publication.
4. Talukdar, P. (2010), Digital Techniques, N.L. Publications.

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M.SC.IT (S1) 03: Computer Programming using C
4 credits: 120 hours of learning

Course Objectives:

To enable the learners to learn about

- algorithm, flowchart and computer program
- different elements of C programming language
- basic as well as derived data types
- different conditional, control statements used in C language
- the concept of pointers and file handling

Unit 1: Introductory Concepts [5 hours, 5 marks]
Basic definition of Pseudo Code, algorithm, flowchart, program

Unit 2: Elements of C Programming [6 hours, 5 marks]
Characters used in C, Identifiers, Keywords, Tokens, Constants, Variables, Types of C variables, Receiving input and output

Unit 3: Variables and Data types [6 hours, 5 marks]
Integer, character floating point and string; Initialization of variable during declarations; Symbolic Constants, type conversion in assignment

Unit 4: Operators and Expressions [8 hours, 5 marks]

Expression in C, Different types of operators: Arithmetic, Relational and Logical, Assignment, Conditional, Increment and decrement, Bitwise, Comma and other operator (size of, period etc). Precedence and associatively of operators, type casting

Unit 5: I/O Functions [10 hours, 6 marks]
Header Files (stdio, conio), Formatted Input/Output Functions (scanf, printf), Escape Sequences, Character Input/Output Functions (getch, getchar, putchar, gets, puts, getche, clrscr)

Unit 6: Preprocessor Directives [5 hours, 5 marks]
Features of C preprocessor, Macro expansion, Macros with arguments, #if and #elif directives,

Unit 7: Conditional Statements [7 hours, 8 marks]
Conditional Statement- if, if- else, nested if-else, switch-case; break, continue, goto

Unit 8: Loop Control Structures [10 hours, 8 marks]
Concept of Loops, Types of loop: while, do-while, for; nested loops

Unit 9: Storage Class [5 hours, 5 marks]
Automatic, External, Static, Register, Scope and lifetime of variables, Macro, Preprocessor directive

Unit 10: Arrays [10 hours, 8 marks]
Array, Array Declaration, 1-Dimensional array, 2-Dimensional array

Unit 11: Strings [10 hours, 7 marks]
String, String Handling Functions: strlen(), strcmp(), strcpy(), strrev(), strcat(), etc

Unit 12: Functions [10 hours, 8 marks]
Function, Function declaration, Function definition, Function call, Formal and Actual parameter, Recursive function

Unit 13: Pointers [10 hours, 7 marks]
Pointer, Pointer declaration, Passing pointer to a function, Pointer and one-dimensional arrays, Dynamic memory allocation

Unit 14: Structures and Union [10 hours, 10 marks]
Structure Declarations, Definitions, Defining your typedef, Array of Structure, Pointer to Structure. Union Declaration, Definition, Declaration, Uses

Unit 15: File Handling [8 hours, 8 marks]
Concept of File, File Pointer, File Opening in various modes, closing a file, reading and writing on files, Formatted Input/Output, fseek(), ftell(), rewind().

Reference Books:

1. Balagurusamy, E. (2002); Programming in ANSI C; Tata McGrawHill Education.
2. Gottfried Byron, S; Programming with C; Tata McGraw-Hill Education.
3. Kanetkar, Y. P. (2008); Let us C; Jones and Bartlett Publishers, Inc.
4. Thareja, R. (2015); Introduction to C Programming.

M.SC.IT (S1) 04: Fundamentals of Networking and Web Technology
4 credits: 120 hours of learning

Course Objectives:

To enable the learners to learn about

- the basics of computer networks
- different network topologies, network devices, modes of communications etc.
- data transmission mechanisms, network models
- internet and web
- webpage designing using various HTML tags, XML, CSS and dynamic HTML

Unit 1: Introduction to Computer Network [10 hours, 8 marks]
Goals of Computer Network, Types of Computer Network: LAN, MAN, WAN, LAN Transmission Methods, Peer-to-Peer LANs, Broadcast and Point-to-Point Networks, Connection-Oriented and Connection-Less Services.

Unit 2: Network Topology [7 hours, 5 marks]
Definition of Network Topology, Types of Network Topology: Bus, Ring, Star, Mesh, Tree.

Unit 3: Data Communication Modes [10 hours, 8 marks]
Introduction to Signals and Systems, Types of Communication (Analog, Digital), Modes of Communication (Simplex, Half-Duplex, Full-Duplex), Modulation.

Unit 4: Network Devices [5 hours, 5 marks]
Network Interface Card (NIC), Modem, Switch, Router, Gateway.

Unit 5: Data Transmission [8 hours, 8 marks]
Parallel Transmission, Serial Transmission, Bandwidth, Baud length, Switching Techniques: Circuit Switching, Message Switching, and Packet Switching.

Unit 6: Network Models [8 hours, 8 marks]

ISO-OSI Reference Model: Functions of each Layer; Various Terminology used in Computer Network; Connection-Oriented and Connectionless Services, TCP/IP Reference Model, Comparison of ISO-OSI and TCP/IP Model.

Unit 7: Transmission Media [8 hours, 8 marks]
Transmission Medium, Guided Media: Coaxial Cable, Twisted Pair, Fiber Optics Cable: Unguided Media: Radio Waves, Bluetooth, Infrared, Microwave, Satellite, Wireless LANs (IEEE 802.11).

Unit 8: Internet [8 hours, 8 marks]
Definition of Internet, Internet Architecture, Peer-to-Peer, Client-Server, Accessing Technique, Internet Service Providers, Organization of Internet, Internet Protocol Suite, IP Address, Domain Name System, Uniform Resource Locators (URL), Socket, Application of Internet.

Unit 9: Word Wide Web [8 hours, 7 marks]
Web Page, Web Browsers, Web Server, Web Search Engines, Web Cookies, Technologies in WWW.

Unit 10: Introduction to HTML [8 hours, 6 marks]
Basics of HTML, HTML Editor, HTML Tags, Document Structure Tags, Formatting Tags, Hyperlink and Image tags

Unit 11: HTML Lists and Tables [8 hours, 6 marks]
HTML Lists: Unordered, Ordered, Definition Lists; HTML Table tags;

Unit 12: Advanced HTML Tags [8 hours, 5 marks]
Frame tags, HTML Form, Additional Advanced HTML Tags.

Unit 13: Introduction of XML [8 hours, 5 marks]
Introduction to XML, Comparison of HTML and XML, XML Basics, Introduction to DTD

Unit 14: Introduction to CSS [8 hours, 8 marks]
Cascading Style Sheets (CSS), Inline Style, Embedded Style, External Style Sheet, Imported Style Sheet, Ruleset, @ rule, Class Selector, ID Selector, Contextual Selector, Attribute Selector, CSS Properties – background properties, text properties, and border properties

Unit 15: Dynamic HTML [8 hours, 5 marks]
Dynamic HTML, Document Object Model, Features of DHTML

Reference Books:

1. Stallings, W. (2007). Data and computer communications. Pearson Education India.

2. Tanenbaum, A. S., & Wetherall, D. (1996). Computer networks. Prentice-Hall international editions.
3. Norton, P., & Kearns, D. (1999). Peter Norton's Complete Guide to Networking.
4. Gopalan, N. P., & ADIKESAVAN, T. (2014). Web Technology: A Developer's Perspective. PHI Learning Pvt. Ltd.
5. Jackson, J. C. (2006). Web Technologies. Pearson India.
6. Bayross, I. (2005). Web Enabled Commercial Applications Development Using... HTML, DHTML, Javascript, Perl CGI [with CD]. BPB publication.

M.SC.IT (S2) 05: Computer Organization and Architecture
4 credits: 120 hours of learning

Course Objectives:

To enable the learners to learn about

- basic organization of computer
- digital components like adder, subtractor, flip-flops, counter and register
- the types of instruction sets, addressing modes,
- the CISC and RISC architectures

Unit 1: Basic organization of the computer [5 hours, 5 marks]
Basic organization of the computer and block level description of the functional units from program execution point of view; Fetch, decode and execute cycle

Unit 2: Digital Components [8 hours, 8 marks]
Half adder, Full Adder, Half subtractor, Full subtractor, Coder-Decoder, Multiplexer, De-multiplexer, Magnitude Comparator, Flip-Flops, Counter, Register

Unit 3: Data Representation [8 hours, 5 marks]
Data representation, computer arithmetic and their implementation; control and data path, data path components, design of ALU and data path, control unit design.

Unit 4: Computer Arithmetic [8 hours, 5 marks]
Integer representation, sign magnitude representation, twos complement representation, integer arithmetic

Unit 5: Instruction Sets [8 hours, 6 marks]

Elements of a machine instruction, instruction representation, Simple instruction format, Instruction types, number of addresses, Types of operands, Types of operations. Different Instruction Formats, Instruction Types, Instruction Execution, Assembly language notation

Unit 6: Addressing modes [8 hours, 5 marks]
Addressing: Immediate, Direct, Indirect, Registrar, Registrar indirect, Relative Index.

Unit 7:Input-Output Organization [8 hours, 8 marks]
Different I/O techniques (Programmed I/O, Interrupt-Driven I/O), DMA (Direct Memory Access), I/O Processors

Unit 8: Introduction to Cache and Virtual Memory [10 hours, 8 marks]
Memory Hierarchy, Semiconductor memories, internal organization of typical RAM and ROM Memory, Switches, Cache memory, Cache memory access techniques; Mapping functions, Virtual memory, Locality of reference, Paging, Cache Coherence Problem

Unit 9: Memory and I/O access [10 hours, 8 marks]
Memory Read Write operations, Concept of handshaking, Polling Techniques (Serial and Hub Polling) and Interrupt driven I/O, Priority and Daisy Chaining Technique, Introduction to Memory Mapping.

Unit 10: Memory and I/O Interfacing [8 hours, 8 marks]
I/O processor, Priority Encoder, Device Scheduler, Interfacing with the I/O Devices, keyboard, printer and display interfaces

Unit 11: External Memory [8 hours, 8 marks]
Magnetic Disk, Magnetic read write operation, sector, track, inter track and inter sector gap, cylinder, fixed head disk, seek time, access time, transfer time, rotational delay, RAID, Optical memory, Magnetic tap.

Unit 12: Processor structure and Function [10 hours, 8 marks]
Processor organization: Fetch instruction, Interpret instruction, fetch data, process data, write data, Registrar organization, Control and status registrar, Instruction cycle, Instruction pipelining (definition only)

Unit 13: Introduction to Parallel Processing [5 hours, 5 marks]
Introduction to Pipelining and Basics of Parallel Processing, Scalable Architecture

Unit 14: Introduction to CISC and RISC Architecture [5 hours, 5 marks]
CISC (Complex Instruction Set Computers), RISC (Reduced Instruction Set Computers), Examples of CICS and RISC

Unit 15: Parallel Architectures [10 hours, 8 marks]
SISD, SIMD, MISD, MIMD, Scalar, Flynn's Classification of Computer Architecture, Vector, superscalar and pipelined processor, Pipelining, Instruction pipeline, pipeline bubbles, Hazards: - resource conflicts, data dependency, branch difficulty. Vector computing, arithmetic pipeline,

vector and scalar register, chaining, scatter gather operations, vector-register processor, memory-memory vector processor. Array processor

Reference Books:

1. Mano, M. M. (2006). Computer Systems Architecture.
2. Chaudhuri, P. Pal. (2nd Edition, 2003). Computer Organization and Design. PHI.
3. Hammacher, Carl. (Fifth Edition) (International Edition, 2002). Computer Organization. McGrawHill.
4. Rajaraman, V. (Fouth Edition, 2008). Fundamentals of Computers.
5. Stallings, William. (2004). Computer Organization and Architecture Designing for Performance. Pearson Education India.
6. Null, L. & Lobur, J. (2014). The Essentials of Computer Organization and Architecture. Jones & Bartlett Publishers.

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M.SC.IT (S2) 06: Data Structure through C Language
DETAILED SYLLABUS
4 credits: 120 hours of learning

Course Objectives:

To enable the learners to learn about

- data structure, space and time complexity
- linear data structures like arrays, linked lists, stack and queues
- the different searching techniques and sorting algorithms
- graphs and various types of trees

Unit 1: Introduction to Data Structure [10 hours, 10 marks]
Basic concept of data, data type, Elementary structure, Arrays: Types, memory representation, address translation functions for one & two dimensional arrays and different examples.

Unit 2: Algorithms [5 hours, 5 marks]
Complexity, time-Space, Asymptotic Notation

Unit 3: Linked List [10 hours, 8 marks]
Introduction to Linked List, representation of single linked list, linked list operations: Insertion into a linked list, deletion a linked list, searching and traversal of elements and their comparative studies with implementations using array structure.

Unit 4: Stack [8 hours, 7 marks]
Definitions, representation using array and linked list structure, applications of stack.

Unit 5: Queue [8 hours, 7 marks]
Definitions, representation using array, linked representation of queues, application of queue.

Unit 6: Searching [7 hours, 6 marks]
Linear and Binary search techniques, Advantages and disadvantages, Analysis of Linear and Binary search

Unit 7: Sorting [10 hours, 8 marks]
Sorting algorithms (Complexity, advantages and disadvantage, implementation), bubble sort, insertion sort, selection sort, quick sort

Unit 8: Trees [8 hours, 7 marks]
Definition and implementation: Binary Tree, Tree traversal algorithms (inorder, preorder, postorder), postfix, prefix notations; Binary Search Tree: Searching in BST, insertion and deletion in BST.

Unit 9: Dictionary ADT [8 hours, 7 marks]
Search trees, balancing of search trees – AVL trees, Red-Black trees, multi way search trees, 2-3 trees, splay trees, Insertion and Deletion in each of the above data structures, Hashing.

Unit 10: Advance Sorting and Selection Techniques [10 hours, 6 marks]
Heap sort, Shell sort, sorting in linear time, Counting sort, Radix sort. Medians and order Statistics Selection and Adversary arguments. Lower bound on sorting

Unit 11: Priority Queue ADT [8 hours, 6 marks]
Heaps-extended priority queue, min(max) heaps, binomial heap, fibonacci heap and its amortized analysis.

Unit 12: Partition ADT [5 hours, 5 marks]
Union-find algorithms through weighted merge and path compression

Unit 13: Data Structure for external storage operations [7 hours, 5 marks]
B-tree, insertion and deletion in B-trees, external sorting, B^+ tree

Unit 14: Red Black Tree [6 hours, 5 marks]
Definition, properties, Creation, Insertion, left and right rotation, balancing red black tree, deleting node from red black tree

Unit 15: Graph [10 hours, 8 marks]
Introduction to Graph, Graph representation: adjacency matrix, adjacency list, Traversal of graph: depth first search and breadth first search.

Reference Books:

1. Mano, M. M. (2006). Computer Systems Architecture.
2. Aho, A. V. & Hopcroft, J. E. (1999). The Design and Analysis of Computer Algorithms. Pearson Education India.
3. Cormen, T. H., Leiserson, C. E., Rivest, R. L. & Stein, C. (2009). Introduction to Algorithms, MIT Press.
4. Horowitz, E., Sahni, S. & Rajasekaran, S. (2009). Fundamental of Data Structure in C.
5. Kamthane, A. (2009). Programming with ANSI and Turbo C. Pearson Education India.
6. Lipschutz, S. (1987). Schaum's Outline of Data Structure. McGrawHill, Inc.
7. Srivastava, S. K. & Srivastava, D. (2003). Data Structures Through C in Depth. BPB Publications.

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M.SC.IT (S2) 07: Fundamentals of Database Management System
4 credits: 120 hours of learning

Course Objectives:

To enable the learners to learn about

- file structure and how it is different from database management system
- entity relationships, relational databases and relational algebra
- SQL programming to create, manage and retrieve data from tables
- normalization and database recovery

Unit 1: File Structure and Organization [8 hours, 4 marks]
Data and Information, Concept of Field, Key Field; Records and its types, Fixed length records and Variable length records; Files, operation on files, Primary file organization.

Unit 2: Database Management System [8 hours, 5 marks]
Definition of DBMS, File processing system vs. DBMS, Advantages and Disadvantages of DBMS, Database Architecture, Data Independence, Data Dictionary, DBMS Language, Database Administrator.

Unit 3: Data Models [8 hours, 6 marks]
Data Models: Object Based Logical Model, Record Base Logical Model, Relational Model, Network Model, Hierarchical Model.

Unit 4: Entity-Relationship Model [8 hours, 5 marks]
Entity Set, Attribute, Relationship Set, Entity Relationship Diagram (ERD), Extended features of ERD.

Unit 5: Relational Databases [8 hours, 8 marks]
Relational data model; Terms: Relation, Tuple, Attribute, Cardinality, Degree, Domain; Keys : Super Key, Candidate Key, Primary Key, Foreign Key;

Unit 6: Relational Algebra [6 hours, 6 marks]
Operations: Select, Project, Union, Difference, Intersection, Cartesian Product, Natural join.

Unit 7: SQL (Part I) [10 hours, 8 marks]
Introduction of SQL, characteristic of SQL, Basic Structure, DDL Commands, DML, DQL, SELECT Statement, WHERE Clause, Useful Relational Operators, Aggregate Functions, SUM Function, AVG Function.

Unit 8: SQL (Part II) [10 hours, 8 marks]
Compound Conditions and Logical Operators, AND Operator, OR Operator, Combining AND and OR Operators, IN Operator, BETWEEN Operator, NOT Operator, Order of Precedence for Logical Operators, LIKE Operator, Concatenation Operator, Alias Column Names, ORDER BY Clause, Handling NULL Values, DISTINCT Clause

Unit 9: Normalization of Database [10 hours, 10 marks]
Introduction to Normalization, Anomalies of un-normalized Database, Normalization of Database: 1NF, 2NF, 3 NF, BCNF.

Unit 10: Database Design [10 hours, 8 marks]
Design of Relational Database, Functional Dependency Diagram, Dependency-preserving property , lossless join property , algorithms to ensure dependency -preserving property and lossless join property.

Unit 11: System Implementation Techniques [8 hours, 8 marks]

Query processing and optimization- translation between SQL queries and relational algebra;

Unit 12: Transaction Processing [8 hours, 8 marks]
Transaction and System concepts, Desirable properties, Schedules and Recoverability

Unit 13: Concurrency Control [6 hours, 6 marks]
Locking Techniques, Concurrency Control based on timestamp ordering, Multiversion Concurrency Control Techniques

Unit 14: Database Recovery [6 hours, 5 marks]
Concepts and techniques, recovery in multi database systems

Unit 15: **Security and Authentication [6 hours, 5 marks]**
Issues, access control techniques, introduction to multilevel security

Reference Books:

1. Date, C. J. (2006). An Introduction to Database Systems. Pearson Education India.
2. Elmasri, R. & Navathe, S. B. (2015). Fundamentals of Database Systems. Pearson.
3. Silberschatz, A., Korth, H. F. & Sudarshan, S. (1997). Database System Concepts (Vol. 4). New York: McGraw-Hill.
4. Singh, S. K. (2011). Database Systems: Concepts, Design and Applications. Pearson Education India.
5. Ullman, J. D. (1984). Principles of Database Systems. Galgotia Publications.

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M.SC.IT (S2) 08: Open Source Software
4 credits: 120 hours of learning

Course Objectives:

To enable the learners to learn about

- installation of LaTeX, Scilab and Python software application
- different page layouts, packages, classes and applications of LaTeX
- functions, graphics and applications of Scilab

- basic programming concepts in Python

Unit 1: Installation of LaTeX
Installation of LaTeX, Understanding Latex compilation

Unit 2: Introduction to LaTeX
Basic Syntax, Writing equations, Matrix, Tables

Unit 3: Page Layout – I
Page Layout – Titles, Abstract Chapters, Sections, References, Equation references, citation, Table of contents

Unit 4: Page Layout – II
List making environments, Generating new commands, Figure handling, table & figure numbering, List of figures, List of tables, Generating index

Unit 5: Packages
Packages: Geometry, Hyperref, amsmath, amssymb, algorithms, algorithmic graphic, color, tilez listing

Unit 6: Classes
Classes: article, book, report, beamer, slides, letter

Unit 7: Applications of LaTeX
Applications: Writing Resume, Writing question paper, Writing articles/ research papers, Presentation using beamer, inserting graphics, drawing graphics, putting equations like :

$(x+a)^n = \sum_{k=0}^{n} \binom{n}{k} x^k a^{n-k},$

$(1+x)^n = 1 + \frac{nx}{1!} + \frac{n(n-1)x^2}{2!} + \cdots,$

$$f(x) = a_0 + \sum_{n=1}^{\infty} \left(a_n \cos\frac{n\pi x}{L} + b_n \sin\frac{n\pi x}{L} \right)$$

, $e^x = 1 + \frac{x}{1!} + \frac{x^2}{2!} + \frac{x^3}{3!} + \cdots, -\infty < x < \infty$

Unit 8: Installation of Scilab
Installation of Scilab (both windows & Linux)

Unit 9: Introduction to Scilab
Introduction to scilab, Basic syntax, Mathematical Operators, Predefined constants, Handling .sci files, Installation of additional packages e.g. optimization

Unit 10: Functions in Scilab
Built in functions, Complex numbers, Polynomials, Vectors, Matrix operations (functions like inv(), spec(), zeros(), ones(), eye(), rand(). Handling these data structures using built in functions. Functions

Unit 11: Conditional Statements in Scilab
Loops (for & while), Conditional statements

Unit 12: Graphics in Scilab
Graphics handling: 2D, 3D, Generating .jpg files, Function plotting, Data plotting, GUI in scillab, Plotting 2D graphs

Unit 13: Applications of Scilab
Applications: Numerical Linear Algebra (Solving linear equations, eigen values atc.) solving Ordinary Differential Equations, Numerical Analysis – iterative methods, Comparison with C/C++/Matlab

Unit 14: Introduction to Python
Introduction to Python, The procedure to install Python, How to open Python console

Unit 15: Basic Python Commands
Basic Python commands, Python programming

Reference Books:

1. Knuth, D. E., & Bibby, D. (1984). The texbook (Vol. 15). Reading: Addison-Wesley.
2. Mittelbach, F., Goossens, M., Braams, J., Carlisle, D., & Rowley, C. (2004). The LATEX companion. Addison-Wesley Professional.
3. Goossens, M., Rahtz, S. P., Rahtz, S., & Mittelbach, F. (1997). The LATEX graphics companion: illustrating documents with TEX and PostScript (Vol. 3). Addison-Wesley Professional.
4. Sandeep, N. (2017). Introduction to Scilab: For Engineers and Scientists. New York: Apress.
5. Eric Matthes. (2015). Python Crash Course: A Hands-On Project Based Introduction to Programming.

OR

M.SC.IT (S2) 08: Minor Project

4 credits

The guidelines for the project are enclosed in Annexure III.

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M.SC.IT (S3) 09: Introduction to Discrete Mathematics and Formal Languages and Automata
4 credits: 120 hours of learning

Course Objectives:

To enable the learners to learn about

- sets, relations, function and different types of lattices
- propositional logic and Boolean algebra
- graph theory and trees
- finite automata and its different types
- the concept of formal language and regular expression
- context-free grammars, context-free languages and applications

PART I: Discrete Mathematics

Unit 1: Sets, Relations and Functions [6 hours, 7 marks]
Sets – the Empty Set, Finite and Infinite Set, Equal and Equivalent set, Subsets, Power set, Universal set, Venn diagram, Complement of a set, set operations; Concept of relation: identity and inverse relation, types of relation, equivalence relation; Concept of function: identity and constant function, types of function.

Unit 2: Lattices [8 hours, 5 marks]
Lattices as partially ordered sets, their properties. Lattices and algebraic systems; Sub lattices, direct products and homomorphism. Some special lattices for example complimented and distributive lattices.

Unit 3: Propositional Logic [8 hours, 6 marks]
Statements, logical connectives, truth tables; Tautologies, contradictions, logical equivalence, Applications to everyday reasoning

Unit 4: Boolean Algebra[8 hours, 6 marks]
Boolean Algebra, Relation of Predicate Calculus to Boolean algebra

Unit 5: Counting Principles [8 hours, 6 marks]
The Pigeonhole principle - counting; Permutation and Combination: Definition of Permutation and combination, Simple application of permutation and combination, Principle of Inclusion-Exclusion

Unit 6: Basic Algebraic Structure [8 hours, 6 marks]
Binary operations, identity and inverse of an element, group, subgroup, coset, cyclic group, normal subgroup, quotient group; Ring, Commutative Ring, Integral domain and Field

Unit 7: Graph Theory [10 hours, 8 marks]
Basic concepts- finite and infinite graphs, incidence and degree, isolated and pendant vertices, null graph; Paths and Circuits- isomorphism, subgraphs, walks, connected and disconnected graphs and components, Euler graphs, Bi-partite graphs, Hamiltonian paths and circuits;

Unit 8: Trees [8 hours, 6 marks]
Trees, Properties of trees, distance and centers, rooted and binary trees, on counting trees, spanning, fundamental circuits, spanning trees in weighted graphs; Cut-sets- properties, connectivity and separability, network flows; Matrix representation of graphs- incidence matrix, submatrices, circuit matrix, cut-set matrix, path matrix, adjacency matrix;

PART II: Formal Languages and Automata

Unit 9: Mathematical preliminaries [6 hours, 6 marks]
Set, Relations and Functions; Properties of Relations, Closure of Relations, Symbols and Alphabets, Strings and their properties, Languages, Principle of Induction.

Unit 10: The Theory of Automata [8 hours, 8 marks]
Definition of Automaton, Finite Automata, Transition Systems, Properties of Transition Functions, Acceptability of a String by a Finite Automata, Finite Automata with Epsilon-transitions;

Unit 11: Types of Finite Automata [10 hours, 8 marks]
Deterministic Finite Automata (DFA), Non-Deterministic Finite Automata (NFA); The Equivalence of DFA and NDFA; Minimization of Finite Automata; Application of Finite automata;

Unit 12: Formal languages [8 hours, 7 marks]
Basic Definition, Definition of a Grammar, Derivation and language generated by a grammar, Chomsky Classification of Languages;

Unit 13: Regular Expressions and Regular Grammars [8 hours, 8 marks]
Regular Set and Regular Grammars; Closure Properties of Regular Languages ; Regular Expressions; Relationship between the Finite Automata and Regular Expressions; The Pigeon-hole principle; Applications of Regular Expressions;

Unit 14: Context-Free Grammars and Languages [8 hours, 8 marks]
Context-Free grammars; Derivation tree, Parse trees; Applications; Ambiguity in Grammars and Languages

Unit 15: Properties of Context-Free Languages [8 hours, 5 marks]
Normal forms for CFGs; The pumping lemma for CFGs; Closure properties of CFL

Reference Books:

1. Rosen, K. H., Trembly, J. P., & Manohar, R. (2015). "Discrete Mathematics and its Applications", Special Indian edition, Tata McGraw-Hill Pub. Co. Ltd., New Delhi,(2007).
2. Rosen, K. H., & Krithivasan, K. (2012). Discrete mathematics and its applications: with combinatorics and graph theory. Tata McGraw-Hill Education.
3. Liu, C. L. (1987). Elements of discrete mathematics. Tata McGraw-Hill Education.
4. Hopcroft, J. E., & Ullman, J. D. (1969). Formal languages and their relation to automata. Addison-Wesley Longman Publishing Co., Inc..
5. Linz, P. (2006). An introduction to formal languages and automata. Jones & Bartlett Learning.

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M.SC.IT (S3) 10: Object-Oriented Programming through C++
4 credits: 120 hours of learning

Course Objectives:

To enable the learners to learn about

- Object-Oriented programming language and its characteristics; and C++ as an object-oriented programming language
- different components of C++ language like conditional statements, control statements, arrays, structure, pointers and functions with examples
- the practical use of object-orientedprogramming approach with uses of classes, objects, inheritance, polymorphism and other features of C++

Unit 1: Introduction to Object-Oriented Programming [5 hours, 5 marks]
Basic concept of OOP, Comparison of Procedural Programming and OOP, Benefits of OOP, C++ compilation, Abstraction, Encapsulation, Inheritance, Polymorphism, Difference between C and C++

Unit 2: Elements of C++ Language [8 hours, 5 marks]
Tokens and identifiers: Character set and symbols, Keywords, C++ identifiers. Variables and constants: Integers & characters, Constants and symbolic constants, Dynamic initialization of variables, Reference variables, Basic data types in C++, Streams in C++, scope resolution operator

Unit 3: Operators and expressions [8 hours, 5 marks]
Operators, Types of Operators in C++, Precedence and Associativity, Manipulators, Enumerated data type, storage classes

Unit 4: Decision and Control Structures [8 hours, 5 marks]
if statement, if-else statement, switch statements, Loop: while, do-while, for; Jump statements : break, continue, goto

Unit 5: Array and Structure [8 hours, 6 marks]
Arrays, structure, unions, Runtime memory management: new and delete operator

Unit 6: Pointer [7 hours, 6 marks]
Introduction, Address operator, pointer variable, pointer definition, pointers and parameter passing, void pointer, pointer arithmetic, Runtime memory management: new and delete operator, Pointers to pointer, Passing address of a pointer, Array of Pointers, Pointers to functions

Unit 7: Functions [7 hours, 6 marks]
main() function, components of function : prototype, function call, definition, parameter; passing arguments; types of function, inline function, function overloading

Unit 8: Introduction to Classes and Objects [8 hours, 6 marks]
Classes in C++, class declaration, declaring objects, Defining Member functions, Inline member function, Array of objects, Objects as function argument, Static data member and mmber function, Friend function and friend class.

Unit 9: Constructors and Destructors [7 hours, 6 marks]
Constructors, Instantiation of objects, Default constructor, Parameterized constructor, Copy constructor and its use, Destructors, Constraints on constructors and destructors, Dynamic initialization of objects.

Unit 10: Operator Overloading [10 hours, 10 marks]
Overloading unary operators: Operator keyword, arguments and return value; Overloading Unary and binary operators: arithmetic operators, manipulation of strings using operators, Type conversions.

Unit 11: Inheritance [10 hours, 8 marks]
Derived class and base class: Defining a derived class, Accessing the base class member, Inheritance: multilevel, multiple, hierarchical, hybrid; Virtual base class, Abstract class.

Unit 12: Virtual Functions and Polymorphism [10 hours, 10 marks]
Virtual functions, Pure virtual functions; Polymorphism, Categorization of polymorphism techniques: Compile time polymorphism, Run time polymorphism.

Unit 13: File Handling [8 hours, 8 marks]
File classes, Opening and Closing a file, File modes, Manipulation of file pointers, Functions for I/O operations

Unit 14: Templates [10 hours, 8 marks]
Introduction, Function template, Function template overloading, Class templates, Template arguments

Unit 15: Object Oriented Design [6 hours, 6 marks]
Object Oriented Design Approaches, Object Modeling Techniques (OMT) tools: Object Model, Dynamic Model, and Functional Model. (Object Diagram, State Diagram, and DFD), Phases of Object-Oriented Development: Object Analysis, System Design, Object Design

Reference Books:

1. Balagurusamy, E. (2011), Object-oriented programming with C++, Tata McGraw-Hill Education
2. Venugopal, K.R. (2013), Rajkumar, Mastering C++. Tata McGrawHill Education
3. Ravichandan D. (2002), Programming with C++, 2e. Tata McGrawHill Education

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M.SC.IT (S3) 11: Operating System
4 credits: 120 hours of learning

Course Objectives:

To enable the learners to learn about

- different types of operating system
- the concept of processes and the interprocess communication with different algorithms
- how operating system handles different processes simultaneously with scheduling
- the concept of deadlock and the detection and recovery mechanism
- the concept of file system, I/O management and basic idea of distributed operating system

Unit 1: Review of Computer Organization [5 hours, 5 marks]
Major Subsystems, I/O Organization, Memory Organization, Bus Organization.

Unit 2: Introduction to Operating System [8 hours, 5 marks]
Definition of Operating System, Batch System, Multi-Programmed System, Time-Sharing System, Single User Operating System, Multi-User Operating System.

Unit 3: Processes [8 hours, 8 marks]
Process: process models, process hierarchies, process states; Threads: use, design issues of thread; Types and Application.

Unit 4: Interprocess Communication [10 hours, 8 marks]
Interprocess communication, race conditions, critical-sections, mutual exclusion, solution to race condition, disabling interrupt, Peterson's solution, sleep & wake up (The Producer Consumer Problem), Semaphores

Unit 5: Scheduling [10 hours, 8 marks]
Basic concepts, primitive and non-primitive scheduling, types of scheduling - batch, interactive and real-time, scheduling algorithms, goals of scheduling algorithms, first come first serve, shortest job first and round robin scheduling.

Unit 6: Deadlocks [9 hours, 8 marks]
Definition of deadlock, principles of deadlock (deadlock conditions & modelling), deadlock detection, recovery & prevention, deadlock avoidance (banker's algorlithm)

Unit 7: Memory Management [10 hours, 10 marks]
Multiprogramming: fixed partitions, relocation and protection; Swapping and its basic concepts; Virtual Memory: Basic concepts, Paging and Page tables, Page Replacement Algorithms (FIFO, LRU; Cache Memory.

Unit 8: Memory Mapping [9 hours, 8 marks]
Associative Mapping, Set-Associative Mapping, Block Set-Associative Mapping, DMA.

Unit 9: File System [9 hours, 8 marks]
Definition of File, File naming, File types(directory, regular), Sequential access and Random access files, File attributes, Operations on file, Hierarchical directory structure, Path name(relative and absolute), Operation on directories, File system implementation techniques.

Unit 10: I/O Management [9 hours, 6 marks]
Basic principles I/O Operations, I/O Devices, Device controllers, DMA, Principles of I/O Software, its goals, Interrupt Handlers, Device Drivers.

Unit 11: Protection [6 hours, 5 marks]
Needs for protection, domain of protection, Example in UNIX, access matrix, Implementation of Access matrix

Unit 12: Security [6 hours, 5 marks]
The security problem, Authentication, Password, password vulnerabilities, Encrypted password, One time password(OTP), Biometrics and its types, Intrusion detection (definition only).

Unit 13: Multiprocessor Systems [8 hours, 6 marks]
Types of Multiprocessor Operating Systems, Multiprocessor OS Functions and Requirements, Multiprocessor synchronization

Unit 14: Distributed Operating Systems [8 hours, 5 marks]
Distributed Processing, Coping with Failures Models of Distributed systems, Remote procedure calls, distributed Shared Memory, Distributed File Systems.

Unit 15: Introduction to Multiprogramming System [6 hours, 5 marks]
Queue management, I/O supervisors, memory management. File system, Disk and Drum Scheduling.

Reference Books:

1. Tanenbaum, A. S., & Woodhull, A. S. (1987). Operating systems: design and implementation (Vol. 2). Englewood Cliffs, NJ: Prentice Hall.
2. Deitel, H. M. (2004). Operating systems. Pearson Education India.
3. Dhamdhere, D. M. (2006). Operating Systems: A Concept-based Approach, 2E. Tata McGraw-Hill Education.
4. Silberschatz, A., Galvin, P. B., Gagne, G., & Silberschatz, A. (1998). Operating system concepts (Vol. 4). Reading: Addison-Wesley.

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M.SC.IT (S3) 12: System Analysis and Design
4 credits: 120 hours of learning

Course Objectives:

To enable the learners to learn about

- system development life cycle, the role of system analyst and system planning
- cost/benefit analysis of a system design and different stages of system development process
- system testing, the criteria of quality assurance of a software system
- project scheduling, implementation issues and their solutions

Unit 1: System Concept [8 hours, 8 marks]
System definition, Characteristics of a system: Organization, Interaction, Interdependence, integration, Elements of a system: inputs and outputs, Processors, control, feedback, environment, boundaries and interface, Types of systems: Physical or abstract system, open or closed system.

Unit 2: System Development Life Cycle [10 hours, 8 marks]
Introduction, Recognition of need, Feasibility study, Analysis, design, implementation, post implementation and maintenance, consideration for candidate system, prototyping,

Unit 3: Role of System Analyst [8 hours, 6 marks]
Introduction, Interpersonal skill, academic and professional qualification, multifaceted role of the analyst, analyst/user interface, conflict resolution, place of analyst in the MIS organization

Unit 4: System Planning and Initial Investigation [10 hours, 8 marks]
Introduction, bases for planning in system analysis, dimensions of planning, strategic MIS planning, Managerial and operational MIS planning, initial investigation, needs identification, determining the user's information requirements, background analysis, fact finding, review of written documents, on site observations

Unit 5: Information Gathering [8 hours, 6 marks]
Introduction, types of information needed, information about the organization, information about user staff, information about work flow, origin of information, review of literature, procedures and forms, interviews and questionnaires

Unit 6: Tools of Structured Analysis [10 hours, 8marks]
Introduction, Data flow diagram (DFD), DFD symbols, constructing a DFD, data dictionary, structured English, decision tree, decision table

Unit 7: Feasibility Study [8 hours, 8 marks]
Introduction, system performance definition, statements of constraints, identification of specific system objectives, feasibility consideration: economic feasibility, technical feasibility, behavioral feasibility, steps in feasibility analysis, feasibility report

Unit 8: Cost/Benefit Analysis [6 hours, 5 marks]
Introduction, data analysis, cost and benefit categories, procedure for cost/benefit determination

Unit 9: The Process and Stages of System Design [10 hours, 8 marks]
Introduction, The process of design : Logical and physical design, design methodologies, structured design, functional decomposition, Forms driven methodology, HIPO and IPO chart

Unit 10: Input/Output and Form Design [8 hours, 6 marks]
Introduction, Input design, input data, source data, input media and devices, online data entry, formatted form, screen design, output design, form design, requirements of form design, types of form, box design

Unit 11: Database Design [10 hours, 8 marks]
Introduction, objective of database, key terms in database, Logical and physical views of data, schemas and subschemas, Types of relationships, Types of data structure : hierarchical, network, relational, entity and attributes, role of dataset administrators, Nornalization

Unit 12: System Testing [6 hours, 6 marks]
Introduction, Need for system testing, nature of test data, test plan, activity network for system testing, types of system test

Unit 13: Quality Assurance [6 hours, 5 marks]
Introduction, quality factor specification, levels of quality assurance, software requirement specification, software design specification.

Unit 14: Implementation [6 hours, 5 marks]
Introduction, conversion, activity network for conversion, file conversion, creating test files, training aids

Unit 15: Project Scheduling [6 hours, 5 marks]
Introduction, reason for system failure, project management, Planning tools: Gantt charts, program evaluation and review techniques (PERT), project management software.

Reference Books:

1. Kendall, K. E., & Kendall, J. E. (2011). Systems analysis and design (Vol. 2013). Upper Saddle River, NJ: Pearson Prentice Hall.
2. Phillips, C. L., Nagle, H. T., & Chakrabortty, A. (2015). Digital control system analysis and design, (Global Edition). Pearson Education Limited.
3. Dennis, A., Wixom, B., & Tegarden, D. (2015). Systems analysis and design: An object-oriented approach with UML. John wiley & sons.

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M.SC.IT (S4) 13: Programming in Java
4 credits: 120 hours of learning

Course Objectives:

To enable the learners to learn about

- Java as an object-oriented programming language with its different components
- the uses of arrays, strings, objects, classes, interface and packages
- graphical user interface design with applets, AWT and swings
- interaction with databases with JDBC

Unit 1: Introduction to JAVA [5 hours, 4 marks]
An overview of JAVA, Basic features of Java, JAVA Environment, Installing the Java SDK, Writing Java Programs

Unit 2: Operators and Assignments [8 hours, 5 marks]
Introduction, Assignment operator, Comparison Operators, Instance of Comparison, Arithmetic operators, Shift operator, Bitwise operator, Logical operator, bitwise operator, conditional operator, casting.

Unit 3: Programming Basic [8 hours, 7 marks]
Java Token & Keywords, Constants, Data types; Declaring a variable, The scope and lifetime of variable, Various Operators, Input/Output statements Decision Making and Control Statements : if statement, If-else, else-if, switch statement; for, while, do-while statements.

Unit 4: Class in Java [9 hours, 8 marks]
Class fundamentals: Defining class, Accessing class members, Declaring objects, Passing Arguments to Methods, Returning Multiple Values from methods, Modifiers

Unit 5: OOP in Java [10 hours, 6 marks]
Class fundamentals: Defining class, Accessing class members, Declaring objects, Constructors, copy constructor; Passing Arguments to Methods, modifiers, Inheritance: the super class, Multilevel Inheritance, Final and abstract keyword, Static Members

Unit 6: Arrays, Strings and Vectors [8 hours, 8 marks]
Declaring Arrays, Creating Arrays, Initializing Arrays, Multi-Dimensional Arrays, Strings: string arrays, string methods, String Buffer class, Vectors

Unit 7: Interfaces and Packages [8 hours, 6 marks]
Interfaces: Defining an Interface, Implementing interfaces, Applying Interfaces, Packages: Defining a package, Accessing and Importing Packages

Unit 8: Threads [8 hours, 6 marks]
Introduction, new threads, creating new threads by extending the thread class, creating a thread by implementing Runnable Interface, Threads in the Running State, Sleeping and Interruptions, Signaling with wait, notify

Unit 9:The java.lang.Math class [8 hours, 5 marks]
Introduction, Methods of the java.lang.Maths: abs, ceil, floor, max, min, random, round, sin, cos, tan, sqrt, exp, log, pow.

Unit 10: Exception Handling [8 hours, 8 marks]
Exception Handling fundamentals, Exception types, Using *try* and *catch,* built-In exceptions in Java, User-defined exception

Unit 11: File Handling [8 hours, 7 marks]
I/O Basics: Streams, The Stream classes, The predefined streams, Reading console input, Writing console output, Reading and writing files

Unit 12: Introduction to Applets [8 hours, 8 marks]
Applets and the World Wide Web, The Applet Class, Applets and HTML , The Life Cycle of an Applet, Using Window Components, Event Handling, Adding Audio and Animation

Unit 13: AWT and Swings [8 hours, 8 marks]
AWT Basics, AWT Components, Event Handling, Application and Menus; Introduction to Swings, Swing Components, Event Handling, Display text and image in a window, Layout manager.

Unit 14: Introduction to JDBC [8 hours, 7 marks]
Basic steps to JDBC, API, JDBC Drivers, Connection Management, JDBC Design Considerations, Two Tier and Three Tier client server model, ResultSet, Prepared statement and callable statement, ResultSet Meta Data Object.

Unit 15: Database programming using Java [8 hours, 7 marks]
Keeping MySQL or NoSQL as backend and using java as front end good GUI should design to insert, update and delete record on a database table.

Reference Books:

1. Schildt, H. (2007). Java: The complete reference. McGraw-Hill.
2. Deitel, P., & Deitel, H. (2011). Java How to program. Prentice Hall Press.
3. Balagurusamy, E. (2007). Programming with Java: A Primer 3E.

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M.SC.IT (S4) 14: Computer Graphics
4 credits: 120 hours of learning

Course Objectives:

To enable the learners to learn about

- computer graphics system, different graphics related drawing algorithms
- different 2D and 3D viewing object representations
- basics of animation and different animation tools

Unit 1:Introduction to Computer Graphics [5 hours, 5 marks]
Definition, Application Areas of Computer Graphics (CAD, CAM, Education and Training, Entertainment, Image Processing, Computer Art etc.), Graphical User Interfaces (GUI)

Unit 2: Graphics Systems [5 hours, 5 marks]
Cathode Ray Tubes, Random Scan Displays, Raster Scan Displays, Color CRT Monitors, Flat-Panel Displays (Plasma-Panels, Liquid Crystal Displays(LCD), Electroluminescent displays), Graphics Software (GKS, PHIGS)

Unit 3:Line Drawing Algorithms [8 hours, 7 marks]
Points and Lines, Line Drawing Algorithms (DDA Algorithm, Bresenham's Line Algorithm)

Unit 4:Circle and Ellipse Drawing Algorithms [8 hours, 7 marks]
Circle drawing algorithms, Ellipse Drawing algorithms

Unit 5: Filled area algorithms [8 hours, 6 marks]
Filling (Scan-Line Polygon filling, Inside outside tests, Boundary-fill and Flood-fill algorithm)

Unit 6:Transformations [10 hours, 8 marks]
Basic 2-D Transformations (Rotation, Reflection, shearing, scaling), Homogeneous Coordinate Representation, Translation, 3-D transformations

Unit 7: 2-D Viewing [10 hours, 8 marks]
2-D Viewing: The viewing pipeline, viewing coordinate reference frame, window to view-port coordinate transformation, viewing functions

Unit 8: Clipping Algorithms [10 hours, 8 marks]
Line and polygon clipping algorithms (Cohen-Sutherland and Cyrus-beck line clipping algorithms, Sutherland –Hodgeman polygon clipping algorithm)

Unit 9: 3-D Object representation [10 hours, 8 marks]
3-D Object representation: Polygon surfaces, quadric surfaces, spline representation, Basic illumination models, polygon rendering methods

Unit 10: Bezier and B-spline curves [9 hours, 7 marks]
Hermite curve, Bezier curve and B-spline curves, Bezier and B-spline surfaces

Unit 11: Projections [9 hours, 8 marks]
Projection Classification, Parallel projections, Perspective projections (One point, Two point), Hidden Layer Projection

Unit 12: 3-D Geometric transformations [8 hours, 8 marks]
Translation, rotation, scaling, reflection and shear transformations, composite transformations

Unit 13: 3-D viewing [8 hours, 5 marks]
Viewing pipeline, viewing coordinates, view volume and general projection transforms and clipping

Unit 14: Basics in Animation [6 hours, 5 marks]
Animation Basic, Computer Animation, Principles of Animation, Types of Animation, Animation Software (Maya, etc) and Hardware, Common Terms in Animation

Unit 15: Animation Designing [6 hours, 5 marks]
Design of Animation sequence, Morphing, Application of Computer Animation, Future of Animation.

Reference Books:

1. Hearn, D., & Baker, M. P. (1997). Computer Graphics: C Version. 2.
2. Marschner, S., & Shirley, P. (2018). Fundamentals of computer graphics. CRC Press.
3. Newman and Sproull. (1979). Principles of Interactive Computer Graphics. McGraw-Hill.
4. Plastock and Kalley. (1986). Computer Graphics, Schaum's Outlines. McGraw-Hill.

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M.SC.IT (S4) 15: Linux System Administration
4 credits: 120 hours of learning

Course Objectives:

To enable the learners to learn about

- Linux as an open source software with its components
- step by step installation process of Linux operating system
- Linux file system structure with different commands
- different system administration task related commands with network administration

Unit 1: Introduction to System Administration [6 hours, 5 marks]
Introduction to System Administration, Role of System Administrator, Qualities of good System Administrator, System Administration Common administrative tasks, identifying administrative files – configuration and log files

Unit 2: Introduction to LINUX Operating System [7 hours, 5 marks]
Basic idea on Proprietary, Open Source, Free Software etc, Basic Features of the Linux operating system, Introduction of Various Linux Distribution (Red Hat Enterprise Linux, Cent OS, Fedora Projects, Debian Linux, Ubuntu, SUSE etc.).

Unit 3: Installation of LINUX Operating System [10 hours, 5 marks]
Installation Requirements, Partitioning the Hard drive in Linux, Installing the Linux system: Using Live CD, Virtual Machine, Direct Installation, Installing and Configuring software in Linux

Unit 4: LINUX Kernel [10 hours, 8 marks]
Linux kernel and device drivers, System Startup and Shutdown, Standard I/O, Standard error, Redirection and Piping

Unit 5: Basics of LINUX File System [8 hours, 7 marks]
Basics of Linux file system - File system types (ext3, ext4, xfs, jfs, ReiserFS, iso9660 etc.), Boot block, Super block, Inode table, Data blocks, How Linux access files, storage files, Linux standard directories, LILO, GRUB Boot Loader, three basic types of files (ordinary or regular, special or device and directory), I-nodes and file attributes, init and run levels

Unit 6: File organization [7 hours, 8 marks]
Files and File System (File Types and Permissions, Links, Size and Space, Date and Time); Working with Files: Reading Files, Searching for files, Copying, Moving, Renaming, Deleting, Linking, and Editing Files; Absolute and Relative path names, File system Mounting and Unmounting, Organization of the file tree, Standard directories and their contents, Disk related commands, checking disk free spaces.

Unit 7: LINUX File Handling Commands [8 hours, 7 marks]
Files and Directory handling Commands - ls, cd, cp, mv, rm, mkdir, rmdir, pwd, Commands for Creating and Viewing ordinary files – cat, more, less, pg

Unit 8: LINUX Filter Commands [8 hours, 8 marks]
Filter Commands – wc, head, tail, cut, tr, top, grep (with regular expressions),. Other commands –tar, unzip, nice, kill, netstat. Setting user and group ownership of files and Access permissions – chmod, chown, chgrp commands

Unit 9: LINUX Shells [10 hours, 8 marks]
Various types of Shell available in Linux, Comparisons between various Shells, Study of different Linux Shells (sh, bash, csh, zsh), Environment variables, Shell script basics (examples of some simple shell programming), Shell programming in bash, read command, conditional and looping statements, case statements, parameter passing and arguments, Shell variables, system shell variables, shell keywords, creating Shell programs for performing various tasks.

Unit 10: Process [7 hours, 7 marks]
Services and Process, Basic commands for starting and stopping processes, Basic process attributes and their role in Access control. Examining the list of running processes on the system and understand the data presented there. Background process, Job control, Crontab file format, Backup and Restore procedure

Unit 11: Printing Jobs [5 hours, 4 marks]

Submit a print job, check the status of a print job, cancel a print job, configuring the Print Queue, Selecting the Print Driver, Editing the Printer configuration

Unit 12: System Administration Tasks [10 hours, 8 marks]
Getting Started: Login process, Creating Users Account and Group, Getting Help, Understanding the "root" account, Managing user accounts-adding, modifying and removing User accounts, changing permissions and ownerships, Creating and managing groups, modifying group attributes, becoming super user using su; limited su (sudo) Changing Password, System monitoring and logging, Monitoring memory usage, disk space usage and I/O activity, Temporary disable user's accounts, creating and mounting file system, checking and monitoring system performance file security & Permissions, Getting system information with uname, host name, disk partitions & sizes, users, kernel. Backup and restore files, reconfiguration hardware with kudzu, installing and removing packages in Linux. Configure X-windows starting & using X desktop. KDE & Gnome graphical interfaces, changing X windows settings.

Unit 13: Networking in LINUX [8 hours, 7 marks]
Installation and configuration of a simple LAN; Installation and configuration of: Proxy server(Squid), DNS server(BIND), Mail server, Web server(Apache), File server(Samba), DHCP server; Installation and configuration of a SSH server and client; Installation and configuration of FTP server and client, rules governing IP address classes and netmasks, Network Address, Netmask and Gateway configuring Interface with ifconfig, ping, netstat, traceroute, telnet, understanding the significance of the /etc/services file and well known port numbers

Unit 14: Network Protocols [8 hours, 7 marks]
Basics of configuring NFS, NIS, DNS, FTP, Squid Proxy, DHCP server, ip tables and firewall

Unit 15: Basic Network Security Issues [8 hours, 6 marks]
Introduction to Basic Network Security Issues, Packet Snifflers, DOS Attacks, Linux Kernel Firewalling, Virtual Private Networks

Reference Books:

1. Das, S. (2012). Your UNIX/Linux: The Ultimate Guide. (Third Edition). (Science/Engineering/Math). McGraw-Hill.
2. Negus, C. (2012). Linux Bible. (Vol. 772). John Wiley & Sons.
3. Hahn, H. (2008). Harley Hahn's Guide to Unix and Linux. California: McGraw-Hill Higher Education.
4. Kanetkar, Y. P. (2003). UNIX Shell Programming. BPB Publications.
5. Bovet, D. P. & Cesati, M. (2005). Understanding the Linux Kernel: from I/O Ports to Process Management. O'Reilly Media, Inc.
6. Burgess, M. (2004). Principles of Network & System Admin. John Wiley & Sons.
7. Das, S. (2000). UNIX, Concepts and Applications. Tata Mc Graw Hill.

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M.Sc.IT (S4) 16: Major Project
4 credits: 120 hours of learning

The guidelines for the project are enclosed in Annexure III.

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ANNEXURE III
PROJECT GUIDELINES

A. PROJECT GUIDE ELIGIBILITY CRITERIA:

Full Time Faculties in the Department of Computer Science/ Information Technology of KKHSOU/ Colleges/ Institutions affiliated to any Indian University recognized by UGC and having minimum 2 years teaching experience.

OR

A person having minimum M.Tech., MCA, M.Sc. in Computer Science/Information Technology from a UGC recognized universities with 4 years experience in Industry/teaching.

B. TYPE OF PROJECT

Learner may choose any topics according to M.Sc.IT standards. Most of the project work falls under the following types

a. Database oriented (e.g. payroll system, Loan management system etc.)

b. Application oriented (e.g. Mobile apps development, web based development)

c. R & D project (e.g. Image processing, speech processing, data mining, networking etc)

C. PROJECT PROPOSAL (SYNOPSIS)

The project proposal or the synopsis is the frame work for carrying out the project. It should be prepared in consultation with Guide. The necessary parts of a project proposal is given in the following form:

* Title of the Project.

* Introduction and Objectives of the Project.

* Project Category (RDBMS/ Application/ R & D).

* Tools, Platform, Hardware and Software Requirement specifications.

* Whether the project is done for any Industry/Client? The Name and Address of the Industryor Client is to be mentioned.

* Methodology

Expected output

* Conclusion

D. APPLICATION AREAS & RELATED TOOLS

A list of selected area for developing the project work is given below:

APPLICATIONS : Financial/ Manufacturing/ Multimedia/ Computer Graphics/ Instructional Design/ DatabaseManagement System/ Internet/ Intranet/ Computer Networking-Communication Software/E-Commerce/TCP/IP Internals/ Routing protocols/ Implementation of Switches & Routers/ Image processing,/ Mobile apps development/ etc..

Related Tools :

FRONT END / GUI Tools : PhP, Scripting languages etc.

RDBMS/BACK END : Oracle, MYSQL, No SQL, DB2 etc.

LANGUAGES : C, C++, Java, VC++, C#, Matlab, Python, Scilab etc.

INTERNET TECHNOLOGIES : DHTML, Java script, VB Script, HTML, Java, Active X, SWING, JSP,ASP, PHP, XML, Java Beans, Java Servlets, CSS, VB.Net,AWT, J2EE.

NETWORKING TECHNOLOGIES : ATM, Frame Relay, TCP/IP, SNMP, GSM, VoIP, PPP, IP-PSTN, SONET/SDH

WIRELESS TECHNOLOGIES : BlueTooth, 3G, ISDN, EDGE

OPERATING SYSTEMS : WINDOWS/ DOS / UNIX / LINUX /ANDROID.

PROJECT REPORT GUIDELINE

The Project report should prepared in well structured preferably typed in Latex. Depending on the type of project the report should be as follows

Database project:

Acknowledgement
Content with page number
Declaration Certificate
Certificate from Guide

CHAPTER I : INTRODUCTION

1.1 Brief idea about the project
1.2 Objective of the project
1.3 Scope of the project
1.4 Existing system
1.5 Proposed System
1.6 Platform used(Hardware & Software)
1.7 Project location

CHAPTER II : REQUIREMENT ANALYSIS

2.1 Introduction
2.2 Tools used for Requirement gathering
2.3 Problem in Existing System
2.4 Conclusion

CHAPTER III : LOGICAL DESIGN

3.1 Introduction
3.2 DFD(0^{th}, 1^{st}, 2^{nd} level)
3.3 ER diagram
3.4 Use case diagram
3.5 Activity diagram
3.6 Conclusion

CHAPTER IV : PHYSICAL DESIGN

4.1 Introduction
4.2 Database Design(Give your normalized database here)
4.3 Module design
4.4 Input/output design
4.5 Conclusion

CHAPTER V : IMPLEMENTATION

5.1 Introduction
5.2 Process description (if any)
5.3 Output & Report
5.4 Conclusion

CHAPTER VI : TESTING

6.1 Introduction
6.2 Types of testing performed
6.3 Conclusion

References
Appendix(if any)

R & D/ Application project:
Acknowledgement
Content with page number
Declaration Certificate
Certificate from Guide

CHAPTER I : INTRODUCTION

1.1 Brief idea about the project

1.2 Objective of the project
1.3 Scope of the project
1.4 Application of the project
1.5 Proposed System
1.6 Platform used(Hardware & Software)
1.7 Project location

CHAPTER II : LITERATURE REVIEW

2.1 Introduction
2.2 Work already done in the area(Historical evidence)
2.3 Problem in Existing technology
2.4 Conclusion

CHAPTER III : THEORITICAL BACKGROUND

3.1 Introduction
3.2 Theory used in the project
3.3 Conclusion

CHAPTER IV : RESULT AND DISCUSSION

4.1 Introduction
4.2 Methodology
4.3 Result
4.4 Analysis on result
4.5 Conclusion

CHAPTER VI : Conclusion & Future work

6.1 Introduction
6.2 Chapter wise conclusion
6.3 Future work

References
Appendix(if any)

[Note: All project reports(soft copy) must send to Computer Science Department, KKHSOU in the following email address csc@kkhsou.in]

CERTIFICATE OF ORIGINALITY FROM THE GUIDE

This is to certify that the project report entitled .....
submitted to **Krishna Kanta Handiqui State Open University** in partial fulfilment of the requirement for the award of the degree of **MASTER OF SCIENCE IN INFORMATION TECHOLOGY(M.Sc.IT),** is an original work carried out by Mr./Ms..... Enrolment No.: ..... under the supervision of Dr./Mr./Ms.....
The matter embodied in this project is a genuine work done by the student and has not been submitted either to this University or to any other University/Institute for the fulfilment of the requirement of any course of study.

Signature of the Learner

Name
Address
Enrolment No.:

Signature of the Guide

Name
Designation
Address

Study Centre's Seal

FORMAT OF THE PROJECT REPORT

A Project Report on _____

Font type: Arial
Size: 12, Bold

TITLE OF THE PROJECT

Font type: Arial
Size: 16, Bold

In fulfillment of the requirement for the 6th Semester of Master of Science in Information Technology Programme

Submitted by

.....

(Name of the Learner)
Enrollment No.: .....
Session: .....

Font type: Arial

Under the Guidance of

.....

(Name of the Project Guide)

Study Centre

.....

(Name of the Study Centre)

.....

(Location)