Syllabus for

Two Years M.Sc. Program

in

COMPUTER SCIENCE

BERHAMPUR UNIVERSITY

Berhampur – 760 007, ODISHA

2023

M.Sc. in Computer Science

SEM	COURSE CODE	COURSE NAME	CREDIT	MARKS		TOTAL
				Mid Sem	End Sem	
I	MSCCS C 1.1	DATA STRUCTURES USING C	4	20	80	100
	MSCCS C 1.2	COMPUTER SYSTEM ARCHITECTURE	4	20	80	100
	MSCCS C 1.3	DISCRETE MATHEMATICAL STRUCTURES	4	20	80	100
	MSCCS C 1.4	DATABASE MANAGEMENT SYSTEM	4	20	80	100
	MSCCS P 1.5	LAB –1: DATA STRUCTURE & DBMS LAB	2	10+10	40+40	100
II	MSCCS C 2.1	OBJECT ORIENTED PROGRAMMING USING JAVA	4	20	80	100
	MSCCS C 2.2	OPERATING SYSTEMS	4	20	80	100
	MSCCS C 2.3	DESIGN AND ANALYSIS OF ALGORITHMS	4	20	80	100
	MSCCS C 2.4	DATA COMMUNICATION & COMPUTER NETWORKS	4	20	80	100
	MSCCS P 2.5	LAB –2: JAVA PROGRAMMING LAB	4	20	80	100
	MSC VAC300	Data Analysis with Power BI	Non-Credit Course			
III	MSCCS C 3.1	PYTHON PROGRAMMING	4	20	80	100
	MSCCS C 3.2	ARTIFICIAL INTELLIGENCE	4	20	80	100
	MSCCS C 3.3	SOFTWARE ENGINEERING	4	20	80	100
	MSCCS CBCS	COMPUTER FUNDAMENTALS & C PROGRAMMING	4	20	80	100
	MSCCS P 3.5	LAB-3: PYTHON PROGRAMMING LAB	4	20	80	100
	MSC VAC301	Programming with NumPy and Pandas	Non-Credit Course			
IV	ELECTIVE COURSES (A student has to choose one course from each group)					
	ELECTIVE–I					
	MSCCS E 4.1	DATA WAREHOUSING AND DATA MINING	4	20	80	100
	MSCCS E 4.2	INTERNET OF THINGS	4	20	80	100
	MSCCS E 4.3	CLOUD COMPUTING	4	20	80	100
	ELECTIVE-II					
	MSCCS E 4.4	DIGITAL SIGNAL PROCESSING	4	20	80	100
	MSCCS E 4.5	COMPILER DESIGN	4	20	80	100
	MSCCS E 4.6	BIG DATA ANALYTICS	4	20	80	100
	MSCCS PR 4.1	PROJECT WORK / DISSERTATION AND VIVA VOCE	12			300
					TOTAL	2000

Note: C – Core Course, E – Elective Course, P – Practical, PR - Project

*** CBCS Course to be offered in the 3rd Semester by Computer Science Dept. for others.**

SEMESTER - I

COURSE CODE: MSCCS C 1.1	DATA STRUCTURES USING C
CORE COURSE	4 CREDITS

UNIT-1

Structure of C Program, Identifiers, Primitive Data types, variables, constants, Keywords, input/output statements. Operators and Expressions: Expression evaluation: Operator Precedence and Associativity. Conditional Branching: Simple if, if..else, nested if…else and switch..case, Iteration and loops: For, While, Do ..While statements, nested loops, break and continue statements. Arrays & Strings: One-dimensional, Two dimensional and multi-dimensional arrays

UNIT-2

Using pointers, Function: Declaration, Definition, Call by value, Call by reference, Scope of variables, Storage classes, Recursive functions. Use of Pointers in Inter-function communication via arrays, Strings handling, Dynamic memory allocation. Structures, Defining structures and Array of Structures, Structure vs Union, self-referential structures.

UNIT-3

Abstract Data Types – Definition and Representation, ADT of Stack, Stack and its uses: reversing string, matching parentheses, in fix to postfix. Queue: linear & circular queue. Linked list and its representation, Single, circular and double linked lists. Operations on linked list – Insertion, Deletion, Traversals.

UNIT-4

Tree: Definition and Terminologies, child and parent nodes, Sub tree, root, leaf node, internal node, height of a Binary tree. Binary tree traversals. Graph representation, Graph traversal, AVL tree, B-tree.

Sorting and Searching: Bubble sort, selection sort quick sort and merge sort. Linear and binary search, Fibonacci search.

BOOKS:

1. Behrouz A. Forouzan & Richard F. Gilberg, “A Structured Programming Approach Using C”, 3rd Edition, Cengage Publication, ISBN: 9788131503638, 2007.
2. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, 2nd Edition, Prentice Hall of India, 2015.
3. Byron Gottfried, Schaum's Outline of Programming with C, 3rd Edition, McGraw-Hill, 1st July 2017.

COURSE CODE: MSCCS C 1.2	COMPUTER SYSTEM ARCHITECTURE
CORE COURSE	4 CREDITS

UNIT-1

Computer Function and Interconnections: Computer Components, Computer function, Interconnection Structures, Bus interconnection PCL. Cache memory; Computer Memory System, Cache Memory Principles, Elements of cache Design.

UNIT-2

External Memory: Magnetic Disk, RAID, Optical Memory, Magnetic Tape, External Devices, I/O module, Programmed I/O, Interrupt-Driven I/O, Direct memory access, I/O channels and processors, Fire Wire and infini band.

UNIT-3

CPU structures and function: Processor Organization, register organization, instruction cycle, instruction pipelining, The Pentium Processor.

Reduced Instruction Set computer (RISC): Instruction Execution Characteristics, Use of a large register file, Compiler Based Register optimization, Reduced Instruction Set architecture.

UNIT-4

Instruction-Level Parallelism and super scalar Processors: Overview, design issues, Pentium-4, IA-64 Architecture: Motivation, General Organization, prediction, Speculation, and software pipelining, Multiple Processor Organization, Symmetric Multiprocessors, Vector computation.

BOOKS:

1. Computer Organization and Architecture, Stallings, W. Fourth Edition, PHI-Publication.
2. Computer System Architecture Third Edition, Mano. M. M. PHI-Publication.
3. Computer Architecture and Organization Hayes, J.P. Third Edition, McGraw Hill International-Publication.
4. Parallel programming in c with MPI and Open, Quinn. M. J. TMH-Publication.

COURSE CODE: MSCCS C 1.3	Discrete Mathematical Structures
CORE COURSE	4 CREDITS

UNIT-1

Fundamentals of logic, Prepositional equivalences, Predicates and Quantifiers, quantifiers, Methods of Proof, Sequences and summations, Mathematical induction.

UNIT-2

Sets, Set operation, Properties of binary relation, Equivalence relations and partitions, ordering relation and lattices, Chains and antichains, function and pigeonhole principle.

UNIT-3

The basics of counting, Permutation and combination, Recurrence relations, Solving recur relations, generating functions, inclusion exclusion.

UNIT-4

Introduction to graphs, graph terminology, representing graphs, and isomorphism, Euler and Hamilton paths, Introduction to trees, Application of trees, Groups, Subgroups, Cosets and Langrage's theorem.

BOOKS:

1. Elements of discrete mathematics, C.L. Liu, Second Edition, McGraw Hills International publication.
2. Discrete mathematics and its Applications, Kenneth H. Rosen, Fifth edition, Mc Graw International Publication.
3. Discrete Mathematical structure Bernardi Kolman, Robert C.Busby, Sharon Ros, Prentice Hall of India-Publication
4. Discrete Mathematics for Computer Science and Mathematics, Mott, J.L. Kandel, A.& Baker, T.P Second Edition (P 1999) Discrete Mathematics, N.Ch.S.N. Iyenger, Chnkrasekaran, Venkatesh, Arunachalam. Publication.

COURSE CODE: MSCCS C 1.4	DATABASE MANAGEMENT SYSTEMS
CORE COURSE	4 CREDITS

UNIT-1

Database system: Data Models, Database Languages, transaction management, database system structure, Application architecture.

Entity relationship model: Basic concepts & constraints, Keys, Design Issues, Entity relationship Diagram, weak entity sets, Extended E-R features, design of E-R database scheme, Reduction of an E-R schema to tables, overview of relational model and relational data base design, Normalization, Normal forms.

UNIT-2

SQL: Basic structure, Set Operation, aggregate functions, null values, Nested sub queries, Views, Complex Queries modification of the database, joined relations, Data definition language, Embedded SQL, Domain Constraints, Referential Integrity.

UNIT-3

Query Processing: Measures of query cost, Selection, Operation, Sorting, Join and other Operation, Evaluation of expressions.

Query Optimization: Estimating Statistics of Expression Results, Transformation of Relational Expression, Choice of Evaluation plans, materialized views.

UNIT-4

Transaction: Transaction, Transaction State, Implementation of Atomicity and Durability, Concurrent execution, Serializability, Recoverability, Testing for Serializability.

Concurrency Control: Lock-Based, Timestamp-Based, Validation-based Protocols

Multiple granularity, Multiversion schemes, deadlock handling, concurrency in index structures.

BOOKS:

Database System Concepts, Silberschatz, A, Korth, H.F. and Sudarshan. S, McGraw-Hill

SEMESTER – II

COURSE CODE: MSCCS C 2.1	OBJECT ORIENTED PROGRAMMING USING JAVA
CORE COURSE	4 CREDITS

UNIT-1

Introduction to Java and java programming Environment: Simple java program structure, Java tokens, Java statements, Implementing java program, java virtual machine, command line arguments, programming style, Constants, variables, & data types, constants, variables, data types, declaration of variables, scope of variables, symbolic constants, type casting.

Operators and expressions: arithmetic, logic, relational assignment, increment and decrement, conditional and special operator, arithmetic expression, evaluation of expression, precedence of arithmetic operators, type conversion in expression, operator precedence and associatively, mathematical functions, decision making and branching, decision making and looping.

UNIT-2

Classes, object and methods defining a class, adding variables, adding methods, creating objects, accessing class members, method over loading, static members, nesting methods, inheritance: Extending a class, overriding methods, final variables and methods, final classes, analize methods, abstract methods and classes, visibility control.

UNIT-3

Array, strings and vectors: Creating an array, one dimensional and two dimensional arrays, vectors, wrapper classes,

Interfaces: defining extending, implementing and accessing interfaces.

Packages: Java API packages, using system packages, naming conventions, creating, accessing using packages, adding a class to a packages, hiding classes.

UNIT-4

Errors and Exception: Types of errors, Exceptions, syntax of exception handling code, multiple catch statements, using final statements, throwing our own exceptions, using exceptions for debugging.

Managing I/O files: stream, stream classes, byte stream classes character stream classes I/O classes, file classes, I/O exceptions, creation of files, reading and writing characters, random accesses files, interactive I/O.

BOOKS:

1. Programming with JAVA, E. Balagurusamy, 2nd/ed (TMH)
2. The complete reference JAVA 2, H. Schildt, 5th/ed (TMH)

COURSE CODE: MSCCS C 2.2	OPERATING SYSTEMS
CORE COURSE	4 CREDITS

UNIT-1

Process Synchronization: Concept of processes, Concurrent processes, Threads, Classical synchronization problems, Monitors and its application.

Process Deadlocks: Introduction causes of deadlocks, Deadlock handling strategies, Models of deadlock.

UNIT-2

Memory Management: Background, Logical versus physical address space, swapping, contiguous allocation, Paging, Segmentation, Virtual Memory: Demand paging, Page replacement algorithms.

UNIT-3

Distributed OS and Multi Processor system: Models, Naming, Process migration, Remote Procedure Calls, Multiprocessor Interconnections, Types, Multiprocessor OS functions and requirements, Multiprocessor synchronization.

UNIT-4

Security: Security threats and goals, Penetration attempts, Security Policies and mechanisms, Authentication, Protection and access control formal models of protection.

BOOKS:

1. Advanced concepts in Operating Systems, Mukesh Singhal and Niranjan G. Shivaratri, TMH.
2. Operating System Concepts and Design, Milan Milenkovic, TMH
3. Operating System, H.M. Beitel, Pearson. Operating System concept, Abraham Silberchatz and Peter Bear Galvin, Addison. Wesley.

COURSE CODE: MSCCS C 2.3	DESIGN AND ANALYSIS OF ALGORITHMS
CORE COURSE	4 CREDITS

UNIT-1

Introduction to problems and algorithms, Mathematics for algorithm analysis , Insertion sort Analysing algorithms, Designing of algorithms, Asymptotic notation Standard notations and common functions, Recurrence relations, The substitution method, The recursion-tree method, The master method, Divide and conquer: Min-Max Heap, Priority queue, Heapsort , Quicksort, Merge Sort, Fast Fourier transform ,Finding the convex hull: Graham Scan, Finding the closest pair of points.

UNIT-2

Greedy method: Elements of the greedy strategy, Huffman codes, task-scheduling problem, Fractional Knapsack problem, Coin change problem, Dynamic programming: Assembly-line Scheduling, Matrix-Chain Multiplication, Longest Common Sub-sequence (LCS), 0/1 Knapsack problem.

UNIT-3

Graph algorithms: Basic Definitions and Application, Representations of graphs, Breadth-first search and Depth-first search, Data Structures for Disjoint Sets, strongly connected components, Minimum Spanning Trees: The algorithms of Kruskal and Prim.

UNIT-4

NP-Completeness: Classes P and NP, NP-complete problems.: Reduction of 3SAT to Subset Sum, Approximation Algorithm for TSP.

BOOKS:

1. Thomas H Cormen, Charles E Lieserson, Ronald L Rivest and Clifford Stein, Introduction to Algorithms, Third Edition, MIT Press/McGraw-Hill, 2009.
2. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, Computer Algorithms/ C++, Second Edition, Universities Press, 2007.
3. Sanjoy Dasgupta, Christos H. Papadimitriou and Umesh V. Vazirani, Algorithms, McGraw-Hill, 2008.

COURSE CODE: MSCCS C 2.4	DATA COMMUNICATION & COMPUTER NETWORKS
CORE COURSE	4 CREDITS

UNIT-1

Introduction to Data Communications and Network Models: Protocols and Standards, Layers in OSI Models, Analog and Digital Signals, Transmission Modes, Transmission Impairment, Data Rate Limits, Performance, Digital Transmission, Network Devices & Drivers: Router, Modem, Repeater, Hub, Switch, Bridge (fundamental concepts only).

Transmission Media: Guided Media, Unguided Media, Switching Techniques: Packet Switching, Circuit Switching, Datagram Networks, Virtual-Circuit Networks, and Structure of a Switch.

UNIT-2

Error Detection and Correction: Checksum, CRC, Data Link Control: Framing, Flow and Error Control, Noiseless Channels, Noisy channels, (Stop and Wait ARQ, Slidding Window Protocol, Go Back N, Selective Repeat) HDLC, Point-to-Point Protocol. Access Control: TDM, CSMA/CD, and Channelization (FDMA, TDMA, and CDMA).

UNIT-3

Network Layer: Logical Addressing, IPv4 Addresses, IPv6 Addresses, Virtual-Circuit Transport Layer Protocol, Sockets, Process-Process Delivery, UDP, TCP.

Application layers: DNS, SMTP, POP, FTP, HTTP, Basics of WiFi (Fundamental concepts only).

UNIT-4

Domain Name System (DNS): Name Space, Domain Name Space, DNS in Internet, Resolution and Dynamic Domain Name System (DDNS), Remote logging, Electronic Mail (SMTP) and file transfer (FTP), WWW: Architecture & Web document, HTTP: Transaction & Persistent vs. Non-persistent connection. Introduction to Wi-Fi and Li-Fi Technology.

BOOKS:

1. Data Communications and Networking, 4thEdition by Behrouza A. Forouzan, TMH.
2. Computer Networks, A.S. Tanenbaum, 4th edition, Pearson Education.

SEMESTER - III

COURSE CODE: MSCCS C 3.1	PYTHON PROGRAMMING
CORE COURSE	4 CREDITS

UNIT-1

Features and History of Python, Literal constants, variables and identifiers, data types, Input operations, comments, reserve words, indentation, operators and expressions, operations on strings, other datatypes, conditional branching statements, loop structures, break, continue, pass, else. Functions in Python.

UNIT-2

Concatenating, appending, and multiplying string formatting operators, built-in string methods and functions, slice operation, ord() and chr(), in and not in operations, comparing strings, iterating strings, string module, match(), search() and sub (), find all ()and finditer(). Data structures: sequence, lists, functional programming, tuple, sets, dictionaries.

UNIT-3

Class and Objects: class methods and self-arguments, the _init_(), class variable and object variable, _del_(), public and private data members, calling a class method from another class method, built-in functions to set, get and delete class attributes Inheritance, types, composition or containership, abstract classes or interfaces Operator overloading: implementing Operator overloading, reverse adding, overriding _getitem_() and _setitem_() methods, overriding the in operator, overloading the misc functions.

UNIT-4

Error and Exception handling: handling exceptions, multiple exception blocks, multiple exceptions in a single block, except block without exception, else clause, raising an exception, instantiating exceptions, handling exceptions in invoked functions, built-in and user-defined exceptions, the final block, and predefined cleanup action.

BOOKS:

1. Python programming, Reema Thareja, Oxford publications.
2. Learning python, Marklutz, Oreilly

COURSE CODE: MSCCS C 3.2	ARTIFICIAL INTELLIGENCE
CORE COURSE	4 CREDITS

UNIT-1

Introduction to AI, Structure of Intelligent agent, Characteristics of AI problems, Problem solving by searching: BFS, DFS, Iterative Deepening, Bi-directional search, constraint satisfactory search, informed search, Hill climbing search, best first search, Heuristic function, A*, Problem decomposition, AO*

UNIT-2

Knowledge & reasoning: Agents that reason logically first order logic, syntax and semantics.
Inference in first order logic: Inference rules, modus ponens, Unification, Forward and backward reasoning, Resolution planning, simple planning agent, from problem solving to planning, Situation calculus, planning and acting, conditional planning.

UNIT-3

Learning: Learning from observations, A general model of learning Agents,
Expert systems, Architecture, Knowledge acquisition, MYCIN,
Natural Language processing: Syntactic processing, Semantic analysis.
Practical applications: Machine translation, Effective parsing.

UNIT-4

Introduction to pattern Recognition**:** Recognition & Classification process, Learning Classification patterns, Visual image understanding, Image Transformation.
Perception: Image formation, Image processing operations, speech recognition, Introduction to Robotics.

BOOKS:

1. Artificial Intelligence a Modern Approach, Stuart Russel & Peter Norving, Person Education Asia.
2. Artificial Intelligence, E.Rich and Knight, TMH.

COURSE CODE: MSCCS C 3.3	SOFTWARE ENGINEERING
CORE COURSE	4 CREDITS

UNIT-1

Introduction, Introduction to Software Development processes, Agile software development: Agile methods, Plan-driven and agile development, Extreme programming, Agile Process model: Adoptive software development, scrum, crystal, Agile modelling, Agile unified process.

UNIT-2

Requirements engineering: Functional and non-functional requirements: The software requirements document, Requirements specification, Requirements engineering processes, Requirements elicitation and analysis, Requirements validation, Requirements management

UNIT-3

Object-oriented design using UML: Analysis and Design: Concepts, Classes and Objects. Relationships Among Objects. Inheritance and Polymorphism, Design Concepts, Design Notation and Specification, Design Methodology, Dynamic Modelling, Functional Modelling, Defining Internal Classes and Operations, Design patterns. System modelling: Context models, Interaction models, Structural models, Behavioral models Model-driven engineering

UNIT-4

Architectural design: Architectural design decisions, Architectural views, Architectural patterns, Application architectures, Design and implementation, Testing: Introduction to software testing, verification and validation, unit testing, integration testing, system testing. Software Maintenance.

BOOKS:

1. Rajib Mall, Fundamentals of Software Engineering, Fifth Edition, PHI, 2018.
2. Software Engineering, A Practitioner's Approach, Roger S. Pressman, TMG Hill.
3. Software Engineering, I. Sommerville, 9th Ed., Pearson Education.

In 3rd Sem, a student has to opt for a CBCS course offered by any other department	
CBCS Course	4 CREDITS

SEMESTER – IV

ELECTIVE - I

COURSE CODE: MSCCS E 4.1	DATA WAREHOUSING AND DATA MINING
CORE COURSE	4 CREDITS

UNIT-1

Concept of Data warehousing, 3-tier architecture, Multidimensional data model, schemes for multidimensional databases, OLAP, ROLAP, MOLAP and HOLAP and its operations.

UNIT-2

Data mining: Characteristics and Discrimination, association analysis, Classification and prediction, cluster analysis, concept hierarchies, interestingness measures, data mining query language, Mining association rules.

UNIT-3

Classification and Prediction: Decision tree-based classification, Bayesian classification, Classification by back propagation, k-nearest neighbor classifier, Cluster Analysis: Categorization of clustering methods, portioning methods, k-Means and –medoids.

UNIT-4

Mining spatial databases, mining multimedia database, mining text databases, web usage mining.

BOOKS:

1. Data Mining concepts and techniques, J Hann and M, Kamber (Morgan Kaufaman)
2. Data Mining by A.K. Pujari (University press)

1.

COURSE CODE: MSCCS E 4.2	INTERNET OF THINGS
ELECTIVE COURSE	4 CREDITS

UNIT-1

Introduction & Concepts: Introduction to Internet of Things, Physical Design of IOT, Logical Design of IOT, IOT Enabling Technologies, IOT Levels. Domain Specific IOTs: Home Automation, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry, Health and lifestyle, Challenges and Issues.

UNIT-2

M2M & System Management with NETCONF-YANG: M2M, Difference between IOT and M2M, SDN and NFV for IOT, Software defined Networking, Network Function Virtualization, Need for IOT Systems Management, Simple Network Management Protocol, Limitations of SNMP, Network Operator Requirements, NETCONF, YANG, IOT Systems management with NETCONF-YANG.

UNIT-3

IoT Protocols: Protocol Standardization for IoT and WSN Protocols-SCADA and RFID Protocols-Issues with IoT Standardization Protocols IEEE802.15.4-BACNet Protocol-, Architecture- Network layer – APS Layer – Security.

UNIT-4

Case Study and IoT Application Development: IoT applications in home- infrastructures security, Industries- IoT electronic equipments. Use of Big Data and Visualization in IoT Industry 4.0 concepts.

BOOKS:

1. Vijay Madisetti, Arshdeep Bahga, ”Internet of Things: A Hands-On- Approach”,2014, ISBN:978 0996025515
2. Arshdeep Bahga, Vijay Madisetti, “Internet of Things (A Hands-On-Approach)”, VPT, 2014.
3. Luigi Atzor et.al, “The Internet of Things: A survey, “, Journal on Networks, Elsevier Publications, October 2010.
4. Olivier Hersent, David Boswarthick, Omar Elloumi, “The Internet of Things – Key applications and Protocols”, Wiley, 2012.

COURSE CODE: MSCCS E 4.3	CLOUD COMPUTING
ELECTIVE COURSE	4 CREDITS

UNIT-1

Evolution of Computing Paradigms - Overview of Existing Hosting Platforms, Grid Computing, Utility Computing, Autonomic Computing, Dynamic Datacenter Alliance, Hosting / Outsourcing, Introduction to Cloud Computing, Workload Patterns for the Cloud, “Big Data”, IT as a Service, Technology Behind Cloud Computing.

UNIT-2

A Classification of Cloud Implementations- Amazon Web Services - IaaS, The Elastic Compute Cloud (EC2), The Simple Storage Service (S3), The Simple Queuing Services (SQS), VMware vCloud - IaaS, vCloud Express, Google AppEngine - PaaS, The Java Runtime Environment.

UNIT-3

The Python Runtime Environment- The Datastore, Development Workflow, Windows Azure Platform - PaaS, Windows Azure, SQL Azure, Windows Azure AppFabric, Salesforce.com - SaaS / PaaS, Force.com, Force Database - the persistency layer, Data Security, Microsoft Office Live - SaaS, LiveMesh.com, Google Apps - SaaS, A Comparison of Cloud Computing Platforms, Common Building Blocks.

UNIT-4

Cloud Security – Infrastructure security – Data security – Identity and access management Privacy.

BOOKS:

1. Kai Hwang, Geoffrey C. Fox and Jack J. Dongarra, “Distributed and Cloud Computing from Parallel Processing to the Internet of Things”, Morgan Kaufmann, Elsevier, 2012
2. Barrie Sosinsky, “Cloud Computing Bible” John Wiley & Sons, 2010

ELECTIVE - II

COURSE CODE: MSCCS E 4.4	DIGITAL SIGNAL PROCESSING
ELECTIVE COURSE	4 CREDITS

UNIT-1

Discrete time signals: Elementary discrete time signals, classification of discrete time signals, manipulation of discrete time signals, classification of discrete time signals, interconnection of discrete time systems,

Response of LTI system to arbitrary systems to arbitrary input: Convolution sum, properties of convolution, Causality of LTI system, stability of LTI systems, systems with finite duration, impulse response and infinite duration impulse response.

UNIT-2

Discrete Time system described by Difference equations: Linear time- invariant systems characterized by constant- coefficient difference equations, the impulse response of a LTI systems, implementation of Discrete time systems, correlation of Discrete Time signals: Correlation and Autocorrelation sequences, properties of autocorrelation sequences.

UNIT-3

The Z-Transform: Direct z-transform, properties of z-transform. Relation z-transform,

Relational z-transform: poles and zeros, pole location for causal signals, system function of a LTI systems. The inverse z-transform by contour integration by power series expansion, by partition fraction expansions, One-sided Z- transform: properties, solution of Differences Equations.

UNIT-4

The Discrete Fourier Transform: DFT, DFT as a linear transformation,

Properties of DFT: periodicity Linearity, and symmetry property, Multiplication of two DFTS and circular Convolution; Addition DFT properties,

Linear filtering methods based on DFT: Filtering of long data sequences (overlap save and overlap add method)

Fast Fourier Transform algorithms: Rddix-2 algorithms, decimation-in-time and decimation-in frequency algorithms,

Applications of FFT algorithms: Efficient computation of a DFT of two real sequences, Efficient computation of DFT of a 2N point real sequences.

BOOKS:

1. Digital signal processing by John G. Proakis, D.G. Manolakis, Pearson
2. Digital signal processing by S. Salivahananan, TMH
3. Introduction of Digital signal processing by J.R. Johnson, PHI.

COURSE CODE: MSCCS E 4.5	COMPILER DESIGN
ELECTIVE COURSE	4 CREDITS

UNIT-I

Introduction: Overview and Phases of compilation. Lexical Analysis: Non-Deterministic and Deterministic Finite Automata (NFA & DFA), Regular grammar, Regular expressions and Regular languages, Design of a Lexical Analyzer as a DFA, Lexical Analyzer generator. Syntax Analysis: Role of a Parser, Context-free grammars and Context-free languages, Parse trees and derivations, Ambiguous grammar. Top-Down Parsing: Recursive descent parsing, LL (1) grammars, Non-recursive Predictive Parsing, Error reporting, and Recovery. Bottom-Up Parsing: Handle pruning and shift reduces Parsing, SLR parsers and construction or SLR parsing tables, LR(1) parsers and construction of LR(1) parsing tables, LALR parsers and construction of efficient LALR parsing tables, Parsing using Ambiguous grammars, Error reporting, and Recovery, Parser generator.

UNIT-II

Syntax Directed Translation: Syntax Directed Definitions (SDD), Inherited and Synthesized Attributes, Dependency graphs, Evaluation orders for SDD, Semantic rules, Application of Syntax Directed Translation. Intermediate Code Generation: DAG for expressions, Three address codes - Quadruples and Triples, Types and declarations, Translation of Expressions, Array references, Type checking, and Conversions, Translation of Boolean expressions and control flow statements, Back Patching, Intermediate Code Generation for Procedures.

UNIT-III

Symbol Table: Structure and features of symbol tables, symbol attributes, and scopes. Code Optimization: Objective, Peephole Optimization, Concepts of Elimination of local common subexpressions, Redundant and un-reachable codes, Basics of the flow of control optimization

UNIT-IV

Run-Time Environment: Storage Organizations, Static and Dynamic Storage Allocations, STACK Allocation, Handlings of activation records for calling sequences.Code Generation: Factors involved, Registers allocation, Simple code generation using STACK Allocation, Basic blocks and flow graphs, Simple code generation using flow graphs.

BOOKS:

1. Compilers – Principles, Techniques and Tools, A. V. Aho, M. S. Lam, R. Sethi, J. D. Ullman, Pearson.
2. Compiler Design, K. Muneeswaran, Oxford University Press.

COURSE CODE: MSCCS E 4.6	BIGDATA ANALYTICS
ELECTIVE COURSE	4 CREDITS

UNIT-1

What is big data, why big data, convergence of key trends, unstructured data, industry examples of big data, web analytics, big data and marketing, fraud and big data, risk and big data, credit risk management, big data and algorithmic trading, big data and healthcare, big data in medicine, advertising and big data, big data technologies, introduction to Hadoop, open source technologies, cloud and big data, mobile business intelligence, Crowd sourcing analytics, inter and trans firewall analytics.

UNIT-2

Introduction to NoSQL, aggregate data models, aggregates, key-value and document data models, relationships, graph databases, schemaless databases, materialized views, distribution models, sharding, master-slave replication, peer- peer replication, sharding and replication, consistency, relaxing consistency, version stamps, map-reduce, partitioning and combining, composing map-reduce calculations.

UNIT-3

Data format, analyzing data with Hadoop, scaling out, Hadoop streaming, Hadoop pipes, design of Hadoop distributed file system (HDFS), HDFS concepts, Java interface, data flow, Hadoop I/O, data integrity, compression, serialization, Avro, file-based data structures.

UNIT-4

MapReduce workflows, unit tests with MRUnit, test data and local tests, anatomy of MapReduce job run, classic Map-reduce, YARN, failures in classic Map-reduce and YARN, job scheduling, shuffle and sort, task execution, MapReduce types, input formats, output formats.

BOOKS:

1. Michael Minelli, Michelle Chambers, and Ambiga Dhiraj, “Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today’s Businesses”; Wiley, 2013.
2. P. J. Sadalage and M. Fowler,” NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence “; Addison-Wesley Professional, 2012.

CBCS COURSE OFFERED BY THE
DEPATMENT OF COMPUTER SCIENCE

Course Code: MSCCS CBCS	Computer Fundamentals & C Programming
CBCS COURSE	4 CREDITS

UNIT-1

Key components of a computer system and its functioning, Role of operating system, Operating system services, Multiprogramming, Time sharing, File and directory system.

Problem solving with computers, Problem formulation, Design of solution steps, Writing algorithms, Coding, Compiling, Executing and testing of programs.

UNIT-2

Components of C programming language, Data types, constants and variables, Statements, Operators, Input and Output statements, Control Structures: Conditional and Looping statements, IF, IF.. ELSE, nested IF .. ELSE, SWITCH ..CASE, FOR …, WHILE ..., DO ….WHILE, nested loops.

UNIT-3

Use of Arrays in C language: One dimensional and Multidimensional arrays, Declaration and Operations on Arrays, searching of item in an Array (Sequential and Binary Search), Sorting of Array items using Insertion, Selection and Bubble Sort Techniques, Matrix Operations.

UNIT-4

Use of Functions in C, Built-in Functions, String and Mathematical Library Functions.

User-defined Functions: Function Declaration, Function Definition and Function Call.

Use of Structures in C: Declaration of Structures, Structure Variables, and Array of Structures.

BOOKS:

1. Fundamentals of Computers, V Rajaraman & Neeharika Adabala, PHI Pub.
2. Programming in ANSI C, 8/e, E Balaguruswamy, TMH Publications.
3. Let us C , Yashavant Kanetkar, BPB Publications.